# SCIENCE

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FRIDAY, SEPTEMBER 4, 1896.

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## *THE BUFFALO MEETING.*

THE meeting last week was one of the smallest in the recent history of the Association, but it was of unusual interest and importance. The address of the retiring president, which we have already published, was from a master hand, and the meeting was presided over by one of the great men of science of the world. The scientific work of the sections was as a rule good, and in several cases, especially in chemistry, in geology and in botany, was excellent. We must count on another comparatively small meeting at Detroit next year, but we believe that the outlook has never during the present decade been more hopeful for the Association.

The American Association for the Advancement of Science has two serious difficulties with which it must contend. One of these is the scattering of American men of science over a wide territory; the other is the increased specialization in science

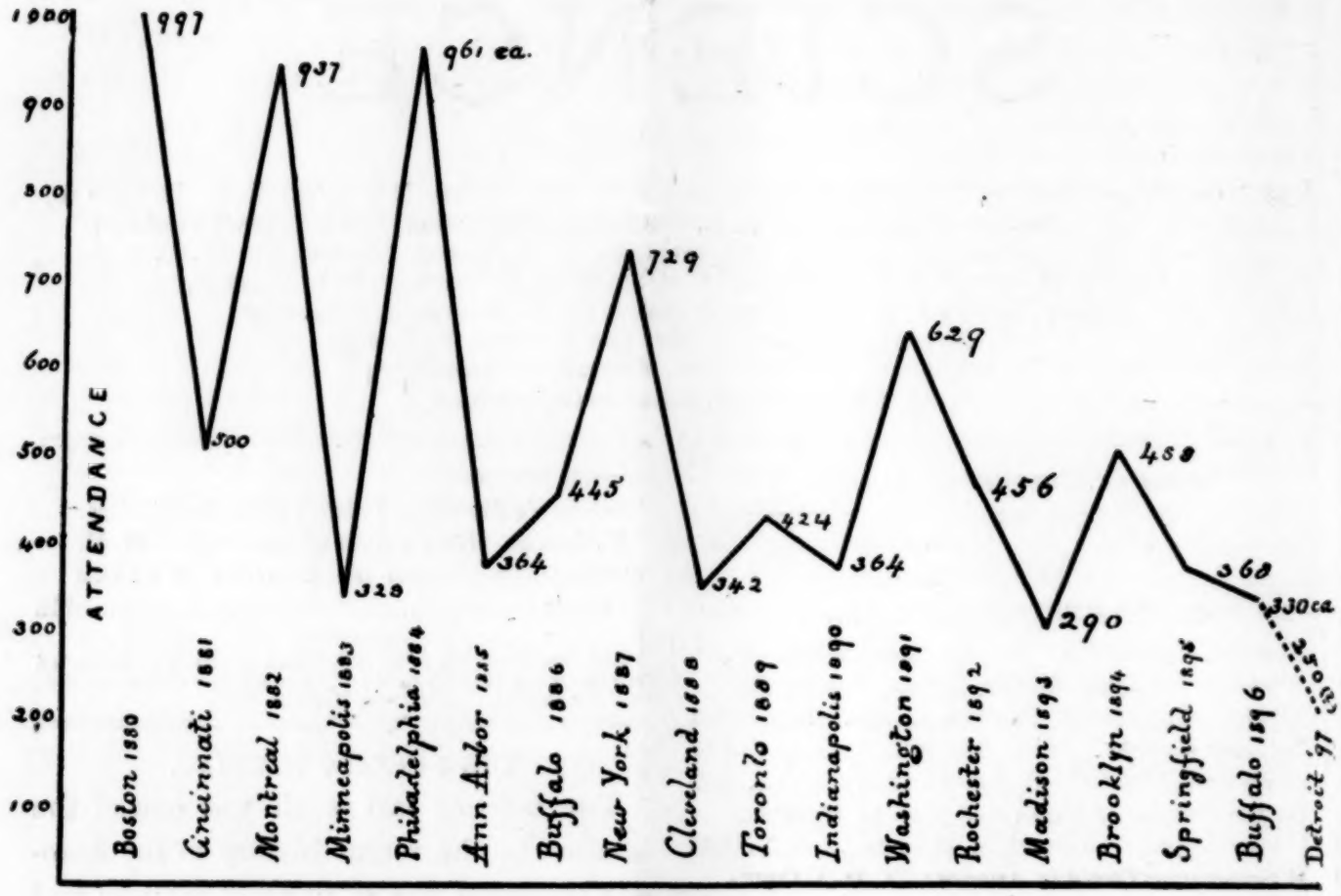


Fig 1.

and the special societies which have sprung up in consequence. Yet these two difficulties are the strongest arguments that can be urged for the necessity of the Association. The fact that men of science are so widely separated, and have no established center where they are likely to come in contact with each other, makes the annual meetings of the Association essential. The fact that great specialization in science is needful makes it peculiarly important for the sciences to be kept in touch. The sciences are but members of science, which is an organic body. As Aristotle has said, "a hand cut off from the rest of the body is no longer a hand."

The dispersion of American men of science is inevitable, and is indeed favorable to the advancement and diffusion of science. We can but appeal to all to promote the common welfare by attending the annual meetings even at a great sacrifice of time and money, and try to make the meetings so valuable that none can afford to be absent. In the case of the special societies arrangements can be made, and are being made, by which they will not weaken, but strengthen, the Association. If part of the time of the meeting be given to these societies, subsections being organized to make specialization as complete as may be desirable, and the rest of the time be given to joint meetings of several sections and of the entire Association for the discussion of questions of common interest and great importance, all the

objects of the Association will be accomplished.

It must be accepted as a fact that the attendance at the meetings (as shown in the accompanying curve) after reaching its maximum from 1880 to 1884 has steadily declined. It is also true that with some noteworthy exceptions, leaders in science have in recent years very generally absented themselves from the meetings. We think this is from no lack of interest in the aims of the Association, but from inertia and habit. It is true in psychology as well as in physics that a body at rest will remain at rest until moved by some external force. Fortunately when once in motion it will continue to move in a straight line. The time has come to apply the force.

The election of Prof. Wolcott Gibbs as president of the Association, and men such as Dr. G. Brown Goode as vice-presidents for some of the Sections, was a courageous act, the value of which cannot be overestimated. A majority of the nominating committee believed that present conditions offered an opportunity for further courageous action of much importance. It was recommended that the Association meet next year at Toronto to welcome the British Association to American territory and to join with them in the scientific work of their sections. The Toronto committee sent a delegate to Buffalo with a cordial invitation, and we could have welcomed the British Association through a retiring president and a president-elect equal in accomplishment to any delegate from Great Britain. The following year will be the fiftieth anniversary of the foundation of the Association, and in Boston or New York, with the same officers, we might have held a meeting far surpassing any in the history of the Association.

The recommendation of the nominating committee was not accepted in the general session. The question was nicely balanced, and there was room for difference of opinion among those interested in the welfare of the Association. It seems, however, evident that the Association should be a true democracy. Having chosen its delegates, their deliberative action should not be reversed by inconsiderate impulse. As Huxley has said, "there may be wisdom in a multitude of counselors, but it is usually in one or two of them.' Folly is also likely to be concentrated in one or two of a crowd, and unfortunately folly is more contagious than wisdom. Whatever may have been the merits of the present question when it was before the nominating committee, the action of the general session has given a warning that should be heeded.

If a meeting apart from the British Association were to be held, Detroit seems to be the best place, and it was of course desirable to choose a time not conflicting with that of the meeting of the British Association. The curve of attendance demon strates that the meetings at Cincinnati, Minneapolis, Ann Arbor, Cleveland, Indianapolis and Madison have always been stepping stones in a downward path, and we fear that a meeting at Detroit, beginning on August 9th, will be no exception. For this very reason we must use our best efforts to make the Detroit meeting creditable, and begin at once to plan for a notable meeting in Boston or New York on the occasion of our fiftieth anniversary.

*AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE: FORTY-FIFTH MEETING, BUFFALO, AUGUST 24–29, 1896.*

THE fourth Buffalo meeting of the American Association for the Advancement of Science, began on Saturday, August 24th, 1896, with the meeting of the Council at noon, in the Iroquois Hotel, with rather more than usual of that body present. The first general session of the Association was held at 10 o'clock Monday, and the last at 8 o'clock on Friday evening.

On Tuesday evening a reception was given to the Association by the ladies of Buffalo in the rooms of the Twentieth Century Club. The Buffalo Club extended the privileges of its house to all members during the week. Thursday afternoon, August 27th, the Geologists were entertained at the Idlewood Club, at the mouth of 18-Mile Creek, a noted fossil collecting ground. On Friday, August 28th, the Botanists were taken ten miles up the Canadian lake shore to Point Abino, where the Section was the guests of the Point Abino Association. The grand trip of the session was a general complimentary excursion for the Association to Niagara Falls, on Saturday, August 29th.

The new arrangement as to time seems to have been generally satisfactory, and is decidedly advantageous in permitting the sections to have sessions for four full days without interruption. The attendance this year was not large, owing doubtless to the economy-provoking condition of political affairs. The registration was 330. 110 new members were elected and 83 members were elected fellows. Horatio Hale, of Clinton, Ont., upon nomination by Section H, was made a life fellow, and Wolcott Gibbs, Professor Emeritus in Harvard University, was elected an honorary fellow. Four foreign associates were elected: Victor Gutzu, of Bucharest, Roumania, sent by his government to investigate petroleum products; Seiryo Mine, of Japan, sent by his government to investigate long distance transmission of electrical power; Miss Mary Foster, member of the Geological Society of London, and J. Bishop Tingle, of Aberdeen, Scotland.

Most of the officers of the Association were present. Vice-President Wm. E. Story, chairman of Section A, was detained by sickness in his family; the untimely death of Capt. John G. Bourke created a vacancy in the secretaryship of Section H, as did the journey to Greenland of Prof. A. C. Gill in that of Section E. Alex. Macfarlane, of South Bethlehem, Pa., was elected vice-president and chairman of Section A; Wm. North Rice and Geo. H. Perkins were elected secretaries of Sections E and H respectively.

The first session was called to order by the retiring president, Edward W. Morley, of Cleveland, who introduced the president-elect, Edw. D. Cope, of Philadelphia, who called upon Bishop Charles H. Fowler, D. D., to pronounce the invocation. The Association was welcomed by a brief address by Mayor Jewett, on behalf of the city, and by Dr. Roswell Park, President of the Buffalo Society of Natural Sciences, on behalf of that body. President Cope responded to the welcome and took occasion to speak of the characteristics of a scientific career. In the afternoon the eight addresses of the vice-presidents were delivered. These will be published in this JOURNAL. In the evening the address of the retiring president (published in the last number of this JOURNAL) was given before a large audience.

A communication regarding the metric system was referred to the Chairman of the Committee on Standards of Measurement, President T. C. Mendenhall. Later that committee presented the following report which was adopted:

*Resolved*, That the A. A. A. S. is now, as it always has been, earnestly in favor of reform in weights and measures, and it urges upon the Congress of the

United States the desirability of further legislation looking to the early adoption of the metric system.

Upon the subject of electrical standards the committee presented the following report which was adopted:

In view of the absence of any properly constructed and authenticated standards of electrical measurement prepared under the law of 1894, this committee recommends that it be authorized to construct such standards, and to pay in part the necessary expenses incident to this work, that the sum of $50 be placed at the disposal of the committee from current funds of the Association in possession of the treasurer; it being understood that any standards thus constructed or material so acquired shall remain the property of the A. A. A. S., until otherwise disposed of by the Council.

A communication from the Joint Commission of the Scientific Societies of Washington regarding the creation of the office of Director-in-Chief of the scientific divisions of the United States Department of Agriculture was referred to a committee which later presented the following report, adopted unanimously:

Your Committee has carefully considered the communication from the Joint Commission referred to, and has consulted sundry other papers sent on from Washington by persons interested in the movement in question. That there has been in Washington a movement towards the creation of such an office is probably familiar to all the members of the Council. The Committee is informed that a circular letter from the Secretary of Agriculture has been sent to many of the members of the Council, and an editorial in SCIENCE has probably familiarized others with the matter. The Department of Agriculture has further been in correspondence with many scientific organizations in the country which could be regularly reached, and all have expressed themselves as favoring the plan.

In brief, the plan is the outgrowth of the unsatisfactory condition of affairs which has existed in the Department of Agriculture for some years, in fact since the great development of its scientific work which has taken place within the last decade. The officer having immediate supervision of the scientific divisions is the Assistant Secretary of Agriculture. This office is filled by Presidential appointment for a term of four years, and it has been found by experience that it takes the person appointed to fill this office about one year to familiarize himself with the details of the work, and that no sooner does he become thoroughly acquainted with the conditions than his term of office expires and a new man is appointed. Further, there is no certainty that the appointee to to fill the office of Assistant Secretary of Agriculture will in every case be a man of broad scientific opinions and able to satisfactorily supervise the work of the scientific divisions.

The great necessity for the existence of an officer of broad attainments, whose term of office would not be limited, and who could act in an advisory and controlling manner, becomes at once apparent. There are at present in the Department two large Bureaus, namely, The Weather Bureau and the Bureau of Animal Industry, and eight divisions engaged in purely scientific work. Of the two thousand men employed in the Agricultural Department, nine hundred and ninety-three are engaged chiefly in scientific and technical work. And of the $2,400,000 appropriated annually, $1,700,000 is appropriated for work of this class.

In view of the evident desirability of legislation in the direction indicated, an amendment to the appropriation bill was introduced in the United States Senate, May 13, 1896, and was referred to the Committee on Agriculture and Forestry. It received a favorable report from the Committee, but no action was taken by the Senate on account of the approaching close of the session. It is hoped that favorable action may be reached during the next session of Congress, and to this end it is proposed to submit to Congress the opinions of prominent individuals and scientific organizations. The proposition has been warmly approved by the following persons and organizations: President Gilman and the Scientific Faculty of Johns Hopkins University. President Dwight and the Scientific Faculty of Yale. Seventeen members of the Scientific Faculty of the University of Michigan. President Elliott and Prof. Shaler, of Harvard. Presidents Schurman, of Cornell; Low, of Columbia; Warren, of Boston; Walker, of the Massachusetts Institute of Technology; Hall, of Clark; Canfield, of Ohio; MacLean, of Nebraska; Chaplin, of Washington (St. Louis), and many other heads of colleges, directors of agricultural experiment stations, members of scientific faculties, various academies of science and scientific societies, the Joint Commission of the Scientific Societies of Washington, Mr. Theodore Roosevelt, and other gentlemen identified with the cause of Civil Service Reform.

In view, therefore, of the obvious good to the cause of science which will result from this proposed legislation, and in view of the practically unanimous endorsement which it has received from prominent educators and men of science throughout the country, and in further view of the fact, which is none the less

true although it has not been publicly mentioned, that this movement is in the direction of the coordination of scientific work under the general government, it seems to your Committee that the American Association for the Advancement of Science can unhesitatingly approve.

Your Committee, therefore, recommends that the Council recommend to the Association the adoption of the following resolution:

*Resolved*, That the American Association for the Advancement of Science heartily approves the proposition to create the office of Director-in-Chief of Scientific Bureaus and Investigations in the Department of Agriculture, to be filled by a broadly educated and experienced scientific man, provided that such appointment shall be made only on the nomination of the National Academy of Science, the legally constituted adviser of the Government in matters relating to science.

L. O. Howard,
*Committee.*

A communication with reference to the proposed vivisection laws was referred to a committee which presented the following report, which was unanimously adopted:

The American Association for the Advancement of Science, at its annual meeting held at Buffalo, August 24th to 28th, 1896, desires to present to the Congress of the United States its protest against legislation on the subject of vivisection. The membership of this Association is composed of experts and authorities and persons interested in different branches of science, in all numbering nearly two thousand. These members come from all parts of the country and represent many diverse interests.

Whereas, This Association was organized for the purpose of advancing science, of diffusing scientific information and exciting widespread interest on the part of the public in scientific progress; therefore, be it

*Resolved*, That this Association deprecates any legislation on the part of the government which would tend in the slightest degree to discourage the advancement of science, more especially biological, chemical and medical science, at this time when greater results are promised than ever before in the history of the world. And

Whereas, The health and welfare of men and animals are vitally affected by the results of animal experiments, and such experiments have effected a saving of many millions of dollars in animal property, and are the basis of our knowledge of hygiene and preventive medicine, and, in part, of surgery; therefore, be it

*Resolved*, That while deprecating cruelty and needless vivisection experiments in the public schools, this Association believes that those who are trained in biological research are the ones who are best able to decide as to the wisdom and utility of animal experimentation and deems that the legislation contemplated by Senate Bill 1552 would be unwise and would tend to retard the increase of knowledge of the means of mitigation of the sufferings of men and animals.

Edward D. Cope,
L. O. Howard,
*Committee.*

A communication asking that some steps be taken by the Association to secure the study of the white race in America was referred to Section H, with a request that a committee be nominated to consider the matter. The section reported the following names and the committee was so constituted: D. G. Brinton, J. McK. Cattell, W. W. Newell, W J McGee, Franz Boas.

A resolution regarding the proper designation of the vice-presidents was referred to a committee consisting of T. C. Mendenhall, F. P. Whitman and L. O. Howard, and upon their recommendation the Council instructed the permanent secretary to use the term *vice-president* in official publications in expressing the relation of the presiding officer of any section to the Association, and the term *chairman* in expressing his relation to the section, the term vice-president preceding the name and chairman following it when both relations are to be expressed. When referred to they are to be called vice-presidents *for* the sections, not *of* the sections.

The Committee on Grants recommended the following which were authorized by the Council: To the Marine Biological Laboratory, Woods Holl, Mass., for a table (appointment to be made by the vice-presidents for Sections F and G and the director of the laboratory), $100; to Francis E. Phillips for investigations on the properties of natural gas, $50; to L. A. Bauer for investigations on terrestrial magnetism in connection with the magnetic survey of Maryland, $50.

At the request of the National Educational Association a committee was appointed to cooperate with committees from the N. E. A., with a view to unifying the requirements in science in secondary schools. The committee named by the Council consists of Profs. R. S. Tarr, H. S. Carhart, A. S. Packard, C. F. Mabery and C. E. Bessey.

Upon the recommendation of Section F, Prof. A. S. Packard was appointed a member of the American Advisory Board on Zoological Names.

Upon the recommendation of Section E, the following were named as delegates to the International Geological Congress at St. Petersburg in 1897, with power to fill any vacancy by a majority vote: E. D. Cope, James Hall, B. K. Emerson, W. N. Rice, C. D. Walcott.

A communication from the American committee upon the proposed monument to Pasteur in Paris was read to the Association, with the statement that the funds of the Association did not warrant an appropriation. The next day the permanent secretary received a check for $100 from the generous patron of the Association, Mrs. Esther Herrmann, requesting that it be sent as the gift of the A. A. A. S. The treasurer was authorized to receive and transmit other gifts in the same way.

The officers of Section C were authorized to confer with those of the American Chemical Society in arranging the program of the next meeting. It is understood that the first two days of the meeting will be officially the meeting of the American Chemical Society, but that opportunity will be given for the proper organization of the section and the vice-president's address. The courtesy of reading papers before Section C is to be extended to members of the A. C. S. and *vice versa*. Similar arrangements were authorized between Section E and the Geological Society of America.

The Committee on the Policy of the Association has been active in considering steps for its further invigoration. Changes in the form and matter of the volume of proceedings, the relation of the affiliated societies, and a number of constitutional amendments permitting greater flexibility in transacting business and arranging for meetings were under consideration by the Council on recommendation by this committee, and it seems likely that some important advances will be made in the near future.

The place of meeting for 1897 and the relation of the Association to the Toronto meeting of the British Association was found a difficult problem. The invitations for 1897 from Indianapolis, Nashville, Columbus, Detroit, Minneapolis, Seattle, San Francisco, Denver and Toronto were all early placed in the hands of a sub-committee consisting of Professors Carhart, Mendenhall and Galbraith for consideration. Representatives of both Nashville and Toronto were present. This committee reported to the Nominating Committee, which debated the question for two hours, finally determining by about a two-thirds majority upon the following recommendation, which was presented to the Association:

> The Committee recommend that the meeting for 1897 be only a formal meeting, that it be held in Toronto on August 17th of that year, and that the Association join in welcoming the British Association for the Advancement of Science to the continent of America.

The recommendation was vigorously opposed and after a two hours' debate was amended so as to require the meeting for 1897 to be a regular meeting, the time and place of which was left to the discretion of the Council.

The officers elected for the next meeting are:

PRESIDENT.

WOLCOTT GIBBS, of Newport, R. I.

VICE-PRESIDENTS.

*A. Mathematics and Astronomy*—W. W. BEMAN, of Ann Arbor, Mich.

*B. Physics*—Carl Barus, of Providence, R. I.
*C. Chemistry*—W. P. Mason, of Troy, N. Y.
*D. Mechanical Science and Engineering*—John Galbraith, of Toronto, Canada.
*E. Geology and Geography*—I. C. White, of Morgantown, W. Va.
*F. Zoology*—G. Brown Goode, of Washington, D. C.
*G. Botany*—George F. Atkinson, of Ithaca, N. Y.
*H. Anthropology*—W J McGee, of Washington, D. C.
*I. Social and Economic Science*—Richard T. Colburn, of Elizabeth, N. J.

PERMANENT SECRETARY.

F. W. Putnam, of Cambridge, Mass. (Office, Salem, Mass.)

GENERAL SECRETARY.

Asaph Hall, Jr., of Ann Arbor, Mich.

SECRETARY OF THE COUNCIL.

D. S. Kellicott, of Columbus, Ohio.

SECRETARIES OF THE SECTIONS.

*A. Mathematics and Astronomy*—James McMahon, of Ithaca, N. Y.
*B. Physics*—Frederick Bedell, of Ithaca, N. Y.
*C. Chemistry*—P. C. Freer, of Ann Arbor, Mich.
*D. Mechanical Science and Engineering*—John J. Flather, of LaFayette, Ind.
*E. Geology and Geography*—C. H. Smyth, Jr., of Clinton, N. Y.
*F. Zoology*—C. C. Nutting, of Iowa City, Iowa.
*G. Botany*—F. C. Newcombe, of Ann Arbor, Mich.
*H. Anthropology*—Harlan I. Smith, of New York, N. Y.
*I. Social and Economic Science*—Archibald Blue, of Toronto, Canada.

TREASURER.

R. S. Woodward, of New York, N. Y.

Charles R. Barnes,
*General Secretary.*

Madison, Wis.

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## *BOTANICAL GARDENS.**

### ORIGIN AND DEVELOPMENT.

The cultivation of plants within small areas for their healing qualities by the monks of the middle ages appears to have been the beginning of the modern botanical garden, although these mediæval gardens doubtless took their origin from others of greater antiquity. Botanical gardens were thus primarily formed for purely utilitarian purposes, although the æsthetic study of planting and of flowers must doubtless have appealed to their owners and visitors. Their function as aids in scientific teaching and research, the one which at present furnishes the dominating reason for their existence, did not develop much, if at all, before the 16th century, and prior to the middle of the 17th century a considerable number existed in Europe, in which this function was recognized to a greater or less degree, of which those at Bologna, Montpellier, Leyden, Paris and Upsala were, perhaps, the most noteworthy. The ornamental and decorative taste for planting had meanwhile been slowly gaining ground, as well as the desire to cultivate rare or unusual species, and during the 18th century attained a high degree of development. Many persons of wealth and influence fostered this taste and became, through the employment of men skilled in botany and horticulture, generous patrons of science. The world was searched for new and rare plants, which were brought home to Europe for cultivation, and many sumptuous volumes, describing and delineating them, were published, mainly through the same patronage. The older gardens were essentially private institutions, but as the rights of the people became more and more recognized, many existing establishments and an increasing number of newly founded ones became, to a greater or less extent, open to the public, either through an admittance fee or without charge. The four main elements of the modern botanical garden have thus been brought into it successively:

1. The utilitarian or economic.
2. The æsthetic.

* Vice-Presidential address before Section G, American Association for the Advancement of Science, Buffalo, N. Y., August 24, 1896.

3. The scientific or biologic.
4. The philanthropic.

These four elements have been given different degrees of prominence, depending mainly upon local conditions, some gardens being essentially æsthetic, some mainly scientific, while in our public parks we find the philanthropic function as the underlying feature, usually accompanied by more or less of the æsthetic and scientific.

*The Economic Element.*—In the broadest extension of this department of a botanical garden there might be included, to advantage, facilities for the display and investigation of all plants directly or indirectly useful to man, and their products. This conception would include forestry, pharmacognosy, agriculture, pomology, pathology and organic chemistry, and, in case the management regards bacteria as plants, bacteriology.

The display of the plants may be effected by growing such of them as will exist without protection in the locality in a plot, more or less individualized, commonly known as the Economic Garden, while those too tender for cultivation in the open are grown in the greenhouses, either in a separate house or section, or scattered through the several houses or sections, in the temperatures best adapted to their growth. The display of plant products, best accompanied by mounted specimens of the species yielding them, by photographs and by plates, is accomplished by the Economic Museum, where these are arranged in glass or glass-fronted cases, suitably classified and labeled. It is believed that the most useful results are obtained by arranging this museum by the products themselves, and thus not in biologic sequence, but by bringing together all drugs, all fibres, all woods, all resins; where the same product is used in more than one industry the exhibit may be duplicated, more or less modified, without disadvantage.

The investigation of economic plants and their products is accomplished through the Scientific Department, and few valuable results can be reached unless the scientific equipment is well developed. The two departments must work conjointly, both on account of the necessity of knowing just what species is under investigation, its structure, distribution and literature, and in order that the most approved and exact methods may be used in the research. Any idea that the scientific element can be dispensed with in connection with economic studies is palpably untenable.

Teaching and research in agriculture, pomology and plant pathology are so well organized in America, through our National Department of Agriculture and our numerous agricultural colleges and schools, that there is no great necessity for providing elaborate equipments for those branches in botanical gardens. But in case the endowment of a garden were sufficiently large to enable them to be successfully prosecuted, in addition to more necessary work, there can be no doubt that important additions to knowledge would be obtained. On the other hand, no such liberal allowances have been made with us for forestry or pharmacognosy, and research and instruction in these sciences must prove of the greatest benefit to the country.

*The Æsthetic Element.*—The buildings, roads, paths and planting of a botanical garden should be constructed and arranged with reference to tasteful and decorative landscape effect. The possibilities of treatment will depend largely upon the topographical character of the area selected and the natural vegetation of the tract. The buildings required are: A fire-proof structure or structures for museum, herbarium, libraries, laboratories and offices; a glass house with compartments kept at several different temperatures for exhibition, propagation and experimentation, or several

separate glass houses; and to these will usually be added dwelling houses for some of the officers, a stable and other minor buildings. The character, number and sizes of the buildings generally depend on financial considerations. In placing the structures intended for the visiting public, considerations of convenient access, satisfactory water supply and the distribution of crowds must be borne in mind, in connection with the landscape design. The planting should follow, as nearly as possible, a natural treatment, except immediately around the larger buildings and at the entrances, where considerable formality is desirable for architectural reasons. It is especially desirable that as much natural treatment as possible should be given to the areas devoted to systematic planting—herbaceous grounds, frutecetum, arboretum. The rectilinear arrangement of plant beds found in most of the older gardens has become abhorrent to landscape lovers, and the sequence of families desired can usually be quite as well obtained by means of curved-margined groups.

The cultivation of decorative plants, and especially the fostering of a taste for them, and the bringing of unusual or new species to attention and effecting their general introduction, are important functions of a botanical garden. For the accurate determination of these plants, information concerning their habits and structure, and suggestions regarding the conditions of their growth, the æsthetic side must rely on the scientific.

*The Scientific or Biologic Element.*—The important relations of the scientific department to the economic and æsthetic have already been alluded to. The library, herbarium, museums and laboratories are the sources whence exact information regarding the name, structure, habits, life-processes and products of plants are derived, and they are the more useful as they are the more complete and thoroughly equipped. It is practically impossible for any one library to have all the literature of botany and related sciences; any one herbarium to possess an authentic and complete representation of all species of plants, or any one museum to be thoroughly illustrative; absolute perfection along these lines cannot be obtained, but the more closely it is approximated the better the results. The research work of the scientific department should be organized along all lines of botanical inquiry, including taxonomy, morphology, anatomy, physiology and paleontology, and the laboratories should afford ample opportunities and equipment for their successful prosecution.

The arrangement of the areas devoted to systematic planting, and the proper labeling of the species grown, are important duties of the scientific department. The sequence of classes, orders and families is usually made to follow some 'botanical system.' It is highly desirable that this should be a system which indicates the natural relations of the families, as understood at the time the garden is laid out, and be elastic enough to admit of subsequent modification, as more exact information relative to those relationships is obtained. The weight of present opinion is overwhelmingly in favor of an arrangement from the more simple to the more complex, and this will apply not only to the systematic plantations, but to the systematic museum and the herbarium.

The scientific possibilities of a botanical garden are the greater if an organic or co-operative relationship exists between it and a university, thus affording ready facilities for information on other sciences.

*The Philanthropic Element.*—A botanical garden operates as a valuable philanthropic agency, both directly and indirectly. Its direct influence lies through its affording an orderly arranged institution for the instruction, information and recreation of the people,

and it is more efficient for these purposes than a park, as it is more completely developed and liberally maintained. Its indirect, but equally important, philanthropic operation is through the discovery and dissemination of facts concerning plants and their products, obtained through the studies of the scientific staff and by others using the scientific equipment.

### NUMBER AND DISTRIBUTION OF BOTANICAL GARDENS.

There are somewhat over 200 institutions denominated botanical gardens, but only a few of them meet the requirements of the foregoing sketch. Some are essentially pleasure parks, with the plants more or less labeled; most of them pay some attention to taxonomy and morphology; many to economic botany; while a small number are admirably equipped in all branches of the science.

I have drawn freely on Prof. Penhallow's first annual report of the Montreal Botanical Garden, published in 1886, for the following approximate statement of the number in different countries:

| | |
|---|---|
| Algeria, 1. | Italy, 23. |
| Australia, 5. | Japan, 1. |
| Austro-Hungary, 13. | Java, 1. |
| Belgium, 5. | Malta, 1. |
| Brazil, 2. | Mauritius, 1. |
| Canada, 1. | Natal, 1. |
| Canary Islands, 1. | New Zealand, 1. |
| Cape of Good Hope, 3. | Norway, 1. |
| Ceylon, 1. | Peru, 1. |
| Chili, 1. | Philippine Islands, 1. |
| China, 1. | Portugal, 3. |
| Cochin China, 1. | Reunion, 1. |
| Denmark, 2. | Roumania, 2. |
| Ecuador, 1. | Russia, 16. |
| Egypt, 1. | Servia, 1. |
| France, 22. | Siberia, 1. |
| Germany, 36. | Spain, 2. |
| Great Britain and Ireland, 12. | Straits Settlements, 1. |
| Greece, 1. | Sweden, 6. |
| Guatemala, 1. | Switzerland, 4. |
| Guiana, 1. | Tasmania, 1. |
| Holland, 4. | United States, 10. |
| India, 7. | West Indies, 6. |

### NOTES ON SOME FOREIGN GARDENS.

1. Buitenzorg, Java. This is the largest botanical garden, occupying some 1100 acres, at altitudes from sea level to about 6000 feet. It was founded by the Dutch government in 1817, and has been well supported. Affording as it does highly favorable conditions for the growth of tropical and subtropical plants under natural conditions, it has yielded most important results, especially in taxonomy and plant physiology, many of which have been published in the ten large volumes of its 'Annales.'

2. The Royal Botanic Gardens at Kew are situated on the south bank of the Thames, about 6 miles west of Hyde Park Corner. They are reached by several railway routes, the time from Charing Cross being about 40 minutes, by steamer, and by omnibus lines. The present area of the gardens is about 260 acres, an addition having been made during the past year. These world-famed gardens originated in the exotic garden of Lord Capel, in 1759. In 1840 they were adopted as a national establishment and opened as a public park. The botanic garden proper occupies about 70 acres, and the remainder is given to arboretum and pleasure grounds. There are two main greenhouses: 1. The palm house, 362 feet long, the central dome rising 66 feet; 2. The temperate house, of which the central portion is 212 feet long, 137 feet broad, and about 60 feet high, flanked by wings which give a total length of about 580 feet, the whole covering between one and one and one-half acres of ground. There are also fourteen other houses, grouped in two ranges and more or less connected, given to special collections. There are three botanical museums: 1. Devoted to economic products; 2. to miscellaneous products; 3. to timbers. There is also a large museum hall given to the exhibition of floral paintings by the late Mari-

enne North. There is a small laboratory equipped for research in physiological botany. The herbarium and library occupy the old palace of the King of Hanover, near the main entrance to the garden, and they are the largest and most complete in the world. The herbaceous ground is planted in long parallel beds and contains several thousand species. The arboretum is thoroughly illustrative of all trees that will grow in the open at Kew, and the shrubs are, for the most part, cultivated in areas by themselves. There are numerous special features, such as the rock garden, the bamboo garden, and the American garden.

The research work of Kew is principally economic and taxonomic. Around it center the 24 botanical gardens and botanical stations of the British colonies, which are manned chiefly by men who have studied or worked at Kew. The principal publications at present emanating from Kew are:

1. The Kew Bulletin of Miscellaneous Information.
2. Hooker's Icones Plantarum.
3. The Continuation of Hooker's Flora of India.
4. The Continuation of the Flora of Tropical Africa.
5. Annual Reports.
6. The Index Kewensis.

The monographs and separate writings of its staff of scientific men are too numerous to review at this point.

3. The Royal Botanical Garden of Berlin is situated in the southwestern part of the city, but a project for moving it out into the country is now being seriously considered. The palm house reaches a height of about 90 feet, being the highest one yet constructed, and too high for satisfactory operation. The botanical museum is very extensive and has series of economic, systematic and archæological collections. The herbarium is one of the largest in the world. The systematic beds are arranged on a strictly modern sequence, and portions of the garden are devoted to plant geography and plant biology. The arboretum is not extensive. Among special features may be mentioned the alpine garden and the collections of Cacti. The garden is an institute of the University, where the principal laboratories are situated. There is also an institute of plant physiology with a small separate garden. The official publications of the Berlin Garden are the 'Notizblatt' and annual reports. A series of volumes of 'Jahrbücher' was issued some years ago. The publications of the garden staff are voluminous and cover all lines of botanical inquiry.

4. The long-established 'Jardin des Plantes,' the gardens of the Museum of Natural History at Paris, are situated in the heart of the city, fronting on the Seine. The conservatories are grouped near the main museum building, at one end of the grounds, are very large and contain a great variety of plants. The botanical library, laboratories, and the enormous herbarium are in a separate older building. The systematic beds are arranged in rows; owing to the limited size of the area devoted to them, they are much crowded, but contain a splendid assortment of species. But little space is given to trees; there are, however, some famous specimens. Many valuable contributions to the literature of botany along all its lines have emanated from this grand institution for over 100 years, published for the most part, in the 'Annales' and 'Archives' of the Museum of Natural History, and in the Bulletin of the Botanical Society of France.

5. The Botanical Garden of the University of Vienna was established about 1754 and is located in the heart of the city. There are here very important and extensive museums, herbaria and libraries, and one large fine greenhouse. The systematic

plantations occupy the larger portion of the tract, and special areas are devoted to the cultivation of medicinal and other economic plants, to an arboretum of native trees, and to groups illustrating plant geography. The garden and associated laboratories provide equipment for the prosecution of all lines of botanical research.

6. The Botanical Garden of Geneva was founded in 1817, and is situated in the heart of the city, near the University. There are two small greenhouses, a very large and important herbarium and library, and a small museum. The laboratories of the University are extensive and well equipped, affording capital facilities for work along all lines of botanical investigation. The De Candolle herbarium and library, and the Boissier herbarium and library, which are near by, afford, in connection with the collections of the garden, unsurpassed facilities for taxonomic study.

7. The Royal Botanic Garden of Edinburgh covers about 60 acres, of which about one-half was added to the older portion some 12 years ago; there are possibilities of still further enlargement. The main greenhouses have a frontage of about 200 feet, the palm house rising some 70 feet, and there are six small special houses. The botanical museum, lecture room and laboratories are in one building, the large herbarium and library in another. The systematic plantations of herbaceous species are extensive, the rock garden being an especially strong feature. The development of arboretum and frutecetum in the newer portion of the tract has made good progress. The institution is in intimate relationship with the University, nearly all the instruction in botany being given at the garden. The research work has been extensive, along taxonomic, morphologic and physiologic lines.

8. The Royal Botanic Garden of Dublin, situated at Glasnevin, just without the city, was founded through the influence of the Honorable and Honorable Dublin Society, in 1790, was for many years supported by this Society with the aid of government grants, and was transferred to the Science and Art Department in 1877. It includes about 40 acres of undulating land, bounded to the north by the small river Tolka. There are eight greenhouses, most of them rather old, but containing a valuable collection. There is a small botanical museum and herbarium. The systematic herbaceous plantations are irregularly shaped beds, arranged in a somewhat radial manner. The arboretum and frutecetum occupy about one-half of the area.

9. The Brussels Botanical Garden lies in the heart of the city and embraces not more than ten acres of land, of which about one-half is given to arboretum. The greenhouses are large but old. There is a very extensive herbarium and library. The systematic beds are arranged as quadrants of a circle, separated by concentric and radial paths. Special areas are devoted to ornamental and economic plants. Owing to the restricted size of the area available a very dense grouping of plants is necessitated. The research work accomplished here has been mainly taxonomic. The Botanical Society of Belgium has its headquarters at the garden.

10. The Imperial Botanical Garden at St. Petersburg is in close affiliation with the Academy of Sciences and the University. There is here a famous herbarium, a large botanical library and museum, and commodious and well-stocked greenhouses. The garden publishes 'Acta,' and many researches prosecuted there are printed in the Bulletin and Memoirs of the Imperial Academy.

11. The Royal Botanic Garden of Trinidad, situated at Port of Spain, was established in 1818, and now occupies about sixty-three acres, with some outlying plantations.

There is a vast collection of tropical plants in cultivation, an extensive botanical library and herbarium and a small laboratory. The garden publishes 'Annual Reports' and 'Bulletin,' dealing especially with topics of economic application.

12. The Botanical Department of Jamaica, West Indies, operates extensive gardens at Kingston, smaller ones at Castleton, and the several large Cinchona plantations. The scientific collections and library are valuable. The department publishes 'Annual Reports' and 'Bulletin,' especially devoted to economic botany.

13. McGill University, at Montreal, Quebec, carries on a small botanical garden in connection with its laboratories. The Montreal Botanic Garden, begun in 1885 on about seventy-five acres of ground in Mount Royal Park, was soon abandoned, owing to political complications.

14. Among other foreign gardens of which mention must be made, and of which a description would be interesting if our time allowed, are those at Munich, Würzburg, Tübingen, Stockholm, Copenhagen, Upsala, Zurich, Calcutta and Oxford.

BOTANICAL GARDENS IN THE UNITED STATES.

The first botanical garden established in America was begun by John Bartram in Philadelphia, in 1728. In it he placed a considerable number of plants obtained in the course of his extensive travels. The plot still remains, including the family homestead, somewhat modified, and it is a pleasure to know that it will be preserved as public ground.

Andre Michaux, in the latter part of the last century, planted gardens at Charleston, S. C., and New Durham, N. J., but they were essentially nurseries from which he sent seeds and plants to Europe.

In the year 1801 Dr. David Hosack, then professor of botany and materia medica in Columbia College, purchased twenty acres of ground in New York city, and called it the Elgin Botanic Garden; in this tract he accumulated, with great labor during the next ten years, a very large and valuable collection of plants. The institution was transferred to the State of New York, through an act of the Legislature, in 1810, and was then known as the Botanic Garden of the State of New York. It was subsequently granted to Columbia College. Funds for its maintenance were not provided, however, and it was ultimately abandoned. Two catalogues of its plants were issued by Dr. Hosack, one in 1806, and another in 1811. The condition of botanical gardens in America at that time is indicated by the following note in Dr. Hosack's catalogue of 1806:

"I learn, with pleasure, that a Botanic Garden is proposed to be established near Boston, and connected with the University of Cambridge. The Legislature of Massachusetts, with a munificence which does them honor, have granted, for this purpose, a tract of land, the value of which is estimated at thirty thousand dollars; and several individuals have evinced their liberality and love of science by voluntary subscriptions, to the amount of fifteen thousand dollars, towards the establishment and support of that institution. Another is also begun at Charleston, S. C., and a third is contemplated in New Jersey, in connection with the College of Princeton."

In the year 1824 there was published at Lexington, Ky., the 'First Catalogues and Circulars of the Botanical Garden of Transylvania University at Lexington, Ky., for the year 1824,' by W. H. Richardson, M. D., President of the Board of Managers, and C. S. Rafinesque, Ph.D., Secretary. This rare pamphlet, which is not recorded in Dr. Call's very complete life and writings of Rafinesque, is of 24 pages, and is printed alternately in English and French. It is essentially an appeal for

plants and material for the garden, and a list of species that it could furnish to kindred institutions. This garden was evidently short-lived, inasmuch as in Rafinesque's 'Neogenyton' of the following year, 1825, he remarks, "I mean, therefore, to indicate and propose in this small essay, many of the numerous new genera of plants detected or ascertained, some of which were indicated last year, 1824, in the Catalogue of the botanical garden which I have tried in vain to establish in Lexington."

The principal gardens at present operated and in course of development in the United States are as follows:

1. The Botanic Garden of Harvard University, at Cambridge, Mass., founded in 1805. There are about seven acres of land under cultivation, a small greenhouse, and a famous herbarium and library from which have flowed during the past 40 years voluminous and invaluable contributions to taxonomy and morphology, especially of North American plants. There is also a small morphologic laboratory. The main laboratories and museums connected with the institution are situated in other of the Harvard buildings, a short distance away. The system of garden, libraries, museum, laboratories and herbaria operated by Harvard College is one of the most complete in existence. It is hard to say, indeed, in what respect it is not ideal, except in the rather wide distance separating the several elements and the small amount of land available for planting.

2. The Arnold Arboretum of Harvard University, at Jamaica Plain, Mass., was founded through a bequest of $100,000, made about 1870, by Mr. James Arnold, of Providence, R. I., to three trustees, to be used for the improvement of agriculture or horticulture. The trustees wisely determined to devote it to forestry and dendrology, and effected cooperative agreements with Harvard College and the City of Boston, which have now given us the greatest tree museum in existence, freely open to the visiting public. The planted area is about 160 acres, and will be materially increased in size. A small museum, library and herbarium building has been erected near the main entrance. The great *Silva of North America* and the journal *Garden and Forest* are noteworthy publications from this noble institution.

3. The Botanic Gardens of the United States Department of Agriculture, at Washington, have an extensive range of greenhouses and a large tract of land under cultivation. The herbarium of the department, now deposited with the United States National Museum, is very large and is at present increasing more rapidly than any other in America. There is a somewhat effective working library, which greatly needs material enlargement, and several poorly located and equipped laboratories, in which a vast amount of important investigation is being accomplished, under very unfavorable conditions, which urgently demand improvement. Publications include: Bulletin of the Botanical Division, Bulletin of the Division of Forestry, Bulletin of the Division of Plant Pathology and Physiology, Contributions from the United States National Herbarium, Year-book of the United States Department of Agriculture, and circulars of the several divisions.

4. The Missouri Botanical Garden, at St. Louis, Mo., was established in 1889, through the provisions of the will of Mr. Henry Shaw, who for over thirty years previously had been bringing together material for it on the land about his residence, which was known as Shaw's Garden. There were in all some 670 acres devised to the institution under the will of the generous and philanthropic founder, and from the income yielded by much of this land, not nearly all the area being required for garden purposes, the institution derives its large main-

tenance fund which will certainly be greatly increased as the land becomes more valuable, and will supply an income sufficient to operate the institution in the most effective manner. There are several greenhouses, a very large and valuable herbarium and library, while the laboratories of the Shaw School of Botany, at Washington University, are in close relationship to the garden. Much important research, principally taxonomic, has been prosecuted. Publications consist of seven volumes of Annual Reports, and nine 'Contributions from the Shaw School of Botany.'

5. The Botanical Garden of the Michigan Agricultural College was begun in 1877. There are now about three acres under high cultivation, exclusive of the arboretum and decorative grounds, which together cover several acres. There are several small greenhouses, an herbarium of about 60,000 specimens, a good botanical library and extensive, well equipped laboratories.

6. The University of California, at Berkeley, has a botanical garden of several acres, established some years ago, in which a large number of plants are grown. It furnishes a valuable adjunct to the work of the botanical department, which has well appointed laboratories, a working library and a large herbarium.

7. The University of Pennsylvania has recently established a garden of about three acres in the immediate vicinity of its building, in Philadelphia, and has many species under cultivation. The extensive and well appointed laboratories of its School of Biology, good library facilities and a small herbarium afford capital opportunity for research, especially in physiology and morphology.

8. Smith College, at Northampton, Mass., has also recently established a botanical garden, on the campus.

9. The Buffalo Botanical Garden, in South Park, Buffalo, N. Y., was commenced in 1893, and has since made rapid and encouraging progress. A small range of greenhouses has been built and others are planned. A beginning has been made in accumulating a library and herbarium, and much permanent planting has been accomplished.

10. The New York Botanical Garden. The establishment of the New York Botanical Garden was authorized by the Legislature in 1891, and the enabling act was amended in 1894. The enterprise was inaugurated and the legislation procured by a committee of the Torrey Botanical Club, appointed in 1889. The Act of Incorporation provided that when the corporation created should have raised or secured by subscription a sum not less than $250,000.00 the Commissioners of Public Parks were authorized to set apart and appropriate a portion of one of the public parks, not exceeding 250 acres, and the Board of Estimate and Apportionment was authorized to issue bonds, aggregating the sum of $500,000.00, for the construction and equipment, within the grounds, of the necessary buildings. The subscription of $250,000.00 required by the Act of Incorporation was completed in June 1895, and the Commissioners of Public Parks, in the following month, formally appropriated 250 acres of the northern part of Bronx Park for the purposes of the Garden. Since that time the preparation of plans for the development of the tract has been steadily progressing, including designs for the museum building and a large horticultural house. This planning is still in progress, in charge of a commission of architects, engineers, gardeners and botanists, who will complete their work within a short time, and be ready to submit a complete scheme to the Board of Managers during the coming autumn. Meanwhile, much preliminary work has been accomplished in clearing the ground, in grading, in the planting of borders, in the establishment of an extensive

nursery, and in the accumulation of herbarium, museum and library material. Through a cooperative agreement entered into with Columbia University, the herbarium and botanical library of the University will be deposited with the Garden, and most of the research and graduate work of the University in botany will be carried on in the Museum Building.

The endowment fund has been materially increased, and about 430 persons have become annual members of the Garden, contributing ten dollars a year each to its support. The publication of a Bulletin has been commenced by the issue, in April, of the first number of Volume I.

N. L. BRITTON.

NEW YORK BOTANICAL GARDEN.

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## *PHILIP LUTLEY SCLATER.*

PHILIP LUTLEY SCLATER, Secretary of the Zoological Society of London, is one of the best known of zoologists. Few men now living have contributed so much as he to systematic ornithology, and none have done so much in the identification and description of new forms from the Western Continent.

His work has been largely in connection with the luxuriant fauna of Neotropical America, little known at the time when he began his researches. Nearly every year since he began work, in 1853, his correspondents in tropical America have laid at his feet new wealth in the form of collections from regions hitherto unexplored.

He has characterized 1,067 new species (245 in collaboration with Osbert Salvin) and 135 new genera (25 with Salvin), as well as two new families of American birds.

Mr. Robert Ridgway writes:

"The name of Sclater is so much a part of Neotropical ornithology that any knowledge of the latter without equal familiarity with the former would be impossible. Certainly no other name occurs so frequently nor ranks more highly in the literature pertaining to the birds of tropical America. Covering a period of more than forty years of unceasing activity, chiefly devoted to this, his favorite geographical field, the importance of Mr. Sclater's contributions to the ornithology of the Neotropical region can hardly be over-estimated. Other ornithologists, it is true, have rendered important services so far as portions of America are concerned, as Salvin for Mexico and Central America, and Lawrence for the same area and the West Indies, while the former has been associated with Sclater in the preparation of various monographic papers, the 'Nomenclator Avium Neotropicalium' and other works; but only Sclater has covered impartially the Neotropical region as a whole.

"Mr. Sclater's treatment of ornithological subjects is concise and conservative—more so, frequently, than some of us would wish it to be. Some of us on this side of the Atlantic differ with him in nomenclatural matters and regarding the status and discrimination of subspecies or geographical races; but in these respects his methods are those of a particular school, which we are pleased to call the 'old,' and which few, if any, of his countrymen have forsaken. We fondly hope, however, that the conservatism of our English brethren may sometime yield to the sound principles upon which the so-called 'American' schools have based their 'innovations,' and the complete harmony of methods between ornithologists of the two countries, so much to be desired, be thereby established.

"Sclater," writes Merriam, "is a good type of the industrious, systematic natuarlist. His official and personal energy brought him a wealth of new material. This he described in an endless series of papers on new species and new genera. Then, as additional specimens and additional species came in, he promptly published more comprehensive treatises in the form of synopses of genera or larger assemblages. And later, when still ampler material cast new light on the subject, he, in numerous instances, revised the same groups over again, correcting early errors, adding new species and bringing the history of the groups down to date. These synopses and monographic revisions are the most important and useful of Sclater's contributions to science. Their number is amazing. In addition to all these, his 'Nomenclator Avium Neotropicalium' and 'Argentine Ornithology' have come to be indispensable to the student of South American birds. And finally, as a fitting climax to this remarkable series, he has lived to erect his own monument in the admirable volumes he has contributed to the British Museum's 'Catalogue of Birds.'

"He has written many important papers concerning mammals, illustrated by colored plates of high

merit. Among the more useful of these are articles on the deer, rhinoceroses and African monkeys. He is now publishing, in connection with Mr. Oldfield Thomas, a magnificently illustrated work, entitled 'The Book of Antelopes,' the second volume of which is already well advanced."

Remarkable as have been his industry and his accuracy in diagnosis and description, his energy and skill as an organizer have been equally noteworthy. But for him many regions now well known to the ornithologist would doubtless still remain unexplored.

His labors have also resulted in extensive additions to our knowledge of the geographical distribution of vertebrates. Not only has he worked out many local faunas, but his generalizations upon the distribution of life and the division of the globe into zoogeographical regions have had great influence. He was one of the pioneers in this field of investigation, and his writings upon the subject have always been full of suggestion and have stimulated many others to engage in similar inquiry. His views as to the geographical distribution of birds are undoubtedly more widely accepted throughout the world than those of any other authority, and though, with increasing knowledge, modifications in the scheme proposed by him long ago will doubtless become more and more numerous, his studies of geographical distribution will always be considered as of fundamental importance, and the terms which he suggested for the principal divisions of the earth's surface will doubtless remain in ordinary use.

For more than thirty years the chief executive officer of the most wealthy and vigorous zoological society in the world, his influence upon the progress of natural history exploration has been very great, and his relations with American naturalists have always been cordial and cooperative.

Notwithstanding the great bulk of his technical publications, he has for four decades been prominent in the social activities of scientific London and a noteworthy figure in the midst of every important scientific gathering.

A complete analytical bibliography of his writings, including nearly 1,300 titles, will soon be published as one of the bulletins of the U. S. National Museum. This will make available to American naturalists all the results of the work of this eminent scholar, who has done for the ornithology of Central and South America what Nuttall, Wilson, Audubon, Baird, Ridgway, Allen, Merriam and their associates have done for that of the northern continent.

Philip Lutley Sclater was born November 4, 1829, at 'Tangier Park,' in Hampshire, the residence of his father, William Lutley Sclater, Esq., and his boyhood was passed chiefly at 'Hoddington House,' another estate in the same county belonging to his father, who died there in 1885 at the age of ninety-seven.

In beautiful Hampshire, not far from the home of Gilbert White at Selborne, he acquired, early in life, a love for outdoor life and a taste for the study of birds.

At the age of ten he was sent to a well-known school at Twyford, near Winchester. In 1842 he went to Winchester College, and in 1845 was elected scholar of Corpus Christi College, Oxford. Being at that time under sixteen years of age, he was not called into residence at the University until Easter, 1846.

At Oxford his attention was given principally to mathematics, though his spare time was occupied by the study of birds and of the excellent series of natural history books then in the Radcliffe Library.

Hugh E. Strickland, the well-known ornithologist, who was at that time resident in Oxford as reader in geology, became interested in young Sclater and took him under his protection. At Strickland's chambers he met John Gould, shortly after his return from his great journey to Australia.

From Strickland he received his first instruction in scientific ornithology. He began his collection of bird skins at Oxford, making British skins for himself and buying foreign species at a shilling apiece, whenever he could get to London for a run among the bird shops.

After taking his degree he remained at his college in Oxford for two years, devoting his time principally to natural history. He also gave much attention to modern languages, studying with masters at home and always visiting the Continent in vacation time, and thus soon made himself familiar with French, German and Italian.

At this period of life he was often in Paris, where he made the acquaintance of the great ornithologist, Prince Charles Bonaparte, at whose house, until his death in 1858, he was a frequent visitor.

In 1851 he entered himself for the bar. In 1855 was admitted fellow of Corpus Christi College, and having in the previous June completed his legal education and been called to the bar by the Honorable Society of Lincoln's Inn, he went the Western Circuit for several years.

In 1856 he made his first journey across the Atlantic, in company with the Rev. George Hext, a fellow collegian. Leaving England in July, they went by New York up the Hudson to Saratoga, and there attended the meeting of the American Association for the Advancement of Science. After that they went to Niagara, and thence through the Great Lakes to Superior City, at the extreme end of Lake Superior. Here they engaged two Canadian 'voyageurs' and traveled on foot through the backwoods to the upper waters of St. Croix River. This they descended in a birch-bark canoe to the Mississippi. Mr. Sclater subsequently published an account of this journey in the third volume of 'Illustrated Travels.'

Returning by steamboat and railway to Philadelphia, he spent a month in that city studying the splendid collection of birds belonging to the Academy of Natural Sciences, where he had the pleasure of the company of John Cassin, Joseph Leidy, John Le Conte and other then well-known members of that institution. He returned to England shortly before Christmas, 1856.

For some years after this he lived in London, practicing occasionally at the bar, but always at work on natural history. He was a constant attendant at the meetings of the Zoological Society, of which he was elected, in 1850, a life member, and in 1857 a member of the Council.

In January, 1859, he made a short excursion to Tunis and eastern Algeria, in company with Mr. E. C. Taylor and two other friends. They visited the breeding places of the vultures and kites in the interior and gathered many bird skins, returning to London at the end of March.

At this time Mr. D. W. Mitchell, secretary of the Zoological Society, was about to vacate his post in order to take charge of the newly instituted Jardin d'Acclimatation in Paris. For this position Mr. Sclater was selected by Owen and Yarrell, then influential members of the Council. He was formally elected to it April 30, 1859, and has been reelected annually ever since.

He found it necessary to devote himself entirely for three years to the reorganization of the affairs of the Society. The 'Proceedings' and 'Transactions' were at that time several years in arrears—they were brought up to date; the 'Garden Guide,' which was out of print, was rewritten; the large staff at the gardens was rearranged and divided into departments under the superintendent, and various other reforms were introduced.

For thirty-five years his life has been almost entirely spent in work connected with natural history.

In 1874, when his brother accepted office

in Mr. Disraeli's administration as President of the Local Government Board, Mr. Sclater became his private secretary, a position which he occupied for two years. But when subsequently offered a place in the civil service he declined it, because he could not make up his mind to give up his dearly loved work in natural history.

His most engrossing duties have been in connection with the Zoological Society of London, to which, as principal executive officer, he has, of course, devoted most of his time. It is conceded by all that its affairs have prospered well under his direction. The number of Fellows of the Society, in 1859 about 1,700, has increased to over 3,000. The income of the Society, which in 1858 was a little over £14,000, is now seldom under £25,000. Besides this, nearly all of the principal buildings in the Society's gardens have been rebuilt during the past thirty-five years and fitted up with every sort of modern convenience for animals. The old office building (No. 11 Hanover square) has been sold and a larger and more convenient one (No. 3 Hanover square) bought in the same vicinity. A debt of £12,000 to the Society's bankers, originally secured upon its house, has been paid off, and this property is now the property of the Society without any sort of incumbrance.

The first floor of the Society's house is devoted to the accommodation of a large and very valuable zoological library, under the care of a librarian and his assistant, and is the constant resort of the working zoologists of the metropolis. This library has been almost entirely accumulated since 1859.

The publications of the Society, consisting of Proceedings, Transactions, Lists of Animals (of which eight editions have been published), the 'Garden Guide' and 'Zoological Record,' are all issued from this office, with almost unfailing regularity. The scientific meetings of the Society are held here during the eight months of the scientific session, and an abstract of their proceedings is always printed and issued within a week after each meeting has taken place.

Mr. Sclater was selected by the British Ornithologists' Union as the first editor of *The Ibis*, in 1859. He finished the first series in 1864. Professor Newton took his place as editor of the second series, and Mr. Salvin as editor of the third. In 1877 he was associated with Mr. Salvin as joint editor of the fourth series, and in 1883 commenced the editorship of the fifth series, with Mr. Howard Saunders as coeditor. When the fifth series was completed, in 1888, he became sole editor of the sixth, which he finished in 1894. In 1895, having again obtained the assistance of Mr. Howard Saunders, he commenced work on the seventh series, of which two volumes are already complete.

When the British Ornithologists' Club was established, in 1892, he joined heartily in the movement inaugurated by Dr. R. Bowdler Sharpe, and has usually had the honor of occupying the chair at its meetings and of delivering an inaugural address at the commencement of each session.

With the British Association for the Advancement of Science he has had a long connection, having become a member in 1847 at the second Oxford meeting, and having attended its meetings with few exceptions ever since. For several years he was secretary of Section D, and at the Bristol meeting in 1875 he was president of that section and delivered an address 'On the Present State of our Knowledge of Geographical Zoology.' In 1876 he was elected one of the two general secretaries of the Association, together with Sir Douglas Galton, and served in that capacity for five years, thereby becoming an *ex officio* member of the Council, at the meetings of which he is a constant attendant.

Ever since the scientific journal *Nature*

was started by Professor Lockyer—in 1869—he has been a frequent contributor to that most important periodical.

In 1886 he began the transfer of his private collection of American bird skins to the British Museum. This collection contained 8,824 specimens, representing 3,158 species, belonging to the orders Passeres, Picariæ and Psittaci. It may be remarked that when he began his collection at Oxford, in 1847, he intended to collect birds of every kind and from all parts of the world, but after a few years resolved to confine his attention particularly to the ornithology of South and Central America and to collect only in the orders just mentioned, which were at that time generally less known than the others and of which the specimens are of a more manageable size for the private collector. At the time of the beginning of this transfer, which was only completed in 1890, he agreed to prepare some of the volumes of the British Museum 'Catalogue of Birds,' relating to the groups to which he had paid special attention. In accordance with this arrangement, by the expenditure of fully two years of his leisure time for each volume, he prepared the eleventh volume in 1886, the fourteenth in 1888, the fifteenth in 1890, and half of the nineteenth in 1891.

When the *Challenger* expedition started around the world, in 1873, at the request of his friend, the late Sir Wyville Thomson, he agreed to work out all the birds. Soon after the return of the expedition, in 1877, the specimens of birds collected were placed in his hands, and with the assistance of his ornithological friends were speedily reported upon in a series of papers contributed to the Zoological Society's 'Proceedings.' The whole of these papers were reprinted with additions and illustrations, and now form part of the second volume of the 'Zoology' of the *Challenger* expedition.

Geography, being very closely connected with zoology, has always commanded Mr. Sclater's hearty interest. He became a life member of the Royal Geographical Society in 1880, and has attended its meetings regularly ever since. He has also served two years on the Council, and is a member of the Geographical Club. He has assisted in promoting many researches in foreign parts, chiefly, however, with a view to obtaining collections of natural history from strange places. Among these may be especially mentioned Sir H. H. Johnston's expedition to Kilima-Njaro in 1884 and Professor Balfour's visit to Socotra in 1880. He also took a leading part in sending out naturalists to Kerguelens Land and Rodriguez, along with the transit-of-Venus expeditions of 1774–75, and in many other similar efforts to explore little-known parts of the earth's surface. At the present time he is serving on two committees of this kind—one for the investigation of the fauna and flora of the Lesser Antilles and the other for the further exploration of the fauna and flora of the Lesser Antilles and the other for the further exploration of the fauna of the Hawaiian Islands. In both of these countries collectors are actively at work.

In 1884 he took advantage of the opportunity of the visit of the British Association to Montreal to cross the Atlantic a second time, and after the meeting to visit the United States. He was not in good health at that period and did little, if anything, in the way of zoology. But he had the pleasure of seeing several of his former friends, especially Lawrence and Baird, and of making the personal acquaintance of Mr. Ridgway, Mr. Allen, Mr. Brewster, Dr. Merriam and many other naturalists.

In 1887, after a continuous residence of more than twenty-five years in London, he gave up his residence in Elvaston Place, where so many American naturalists visiting England have received a hearty wel-

come. He has since lived in Hampshire, at his country house, 'Odiham Priory,' about forty miles from town, taking a house for his family in London for three or four months at the beginning of each year. In summer he constantly visits the Continent, making excursions to see the various zoological gardens and museums.

One of his closest friends was the late Prof. Huxley, long a member of the Council of the Zoological Society, where he was one of Mr. Sclater's most constant supporters. Prof. Huxley, it may be said, was the chief advocate of the project of employing an anatomist at the Society's gardens, and invented the title 'prosector' for the new office. A. H. Garrod who became prosector in 1871, and W. A. Forbes, who succeeded him in 1879—both talented and promising young naturalists—were dear friends of Sclater, and the unfortunate death of Forbes during the excursion to the Niger in 1883 was a most severe blow to him. Notable among his other friends was Charles Darwin, who frequently visited him in his office, bringing long lists of memoranda for conference.

Mr. Sclater married, in 1862, Jane Anne Eliza Hunter Blair, daughter of the late Sir David Hunter Blair, baronet, of 'Blairquhan,' in Ayrshire. He has five children, of whom four are sons. The eldest, William Lutley Sclater, has inherited his father's tastes; he was for four years an assistant in the Indian Museum in Calcutta, and after a short term of service as science master at Eton College was appointed director of the South African Museum at Cape Town, a position which he now occupies.

The second son, Capt. Bertram Lutley Sclater, is an officer in the Royal Engineers, and is now on duty in British East Africa, constructing a road to Uganda from the coast.

The third son, Lieut. Guy Lutley Sclater, an officer in the Royal Navy, is a specialist in torpedo work; while the youngest, Arthur Lutley Sclater, is a tea planter in Ceylon.

Mr. Sclater received the degree of doctor of philosophy, honoris causa, from the University of Bonn in 1860, and in 1861 was elected a fellow of the Royal Society, on the Council of which he has twice served.

At the age of sixty-seven he is still in full mental vigor, and adding each year a number of papers to his already remarkable list. May this useful career be continued for many years to come.

G. Brown Goode.

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### *ON THE FLOATING OF METALS AND GLASS ON WATER AND OTHER LIQUIDS.*

During the progress of a research on the surface tension of liquids, and on the tension of films, I observed that rings of aluminum, made of wires of various diameters, floated on water when these rings were *chemically clean*. A ring 62 millimeters in diameter, made of aluminum rod 3.6 millimeters ($\frac{1}{7}$ inch) in thickness and weighing 5.6 grams floats on water; sometimes for several minutes, sometimes for several hours; the duration of flotation depending on conditions to be stated in a subsequent publication.

I naturally thought that these remarkable phenomena were peculiar to aluminum, because in all the works on physics I have read it is stated that to float a metal on water it is necessary that its surface should previously be greased. (See the latest treatise on physics, by Violle; Vol. I., pt. 2, p. 679.) I found, however, that all metals from platinum of a density of 22 to magnesium of a density of 1.7 float on water when their surfaces are chemically clean.

Rings were made of aluminum, iron, tin, copper, brass and German silver. The wire of these rings is one millimeter thick and the rings are about 50 millimeters in di-

ameter. The axis of the wire of a ring is in a plane; in other words, the rings are flat. Each of these rings has soldered to it a thin wire along a diamter and raised above the plane of the ring. On this wire is cemented a platform of thin metal. These rings are highly polished and are chemically clean.

On loading one of these floating rings, by gradually adding weights on its platform, the ring sinks deeper and deeper below the general surface of the water, till, finally, it breaks through the depresssed surface. On the form of this depressed surface (which I have plotted) depends the amount of weight per centimeter of circumference of the ring, required for the ring to break through the surface of the water. This weight, in the cases of the rings mentioned, is, on the average, 0.155 grams per centimeter, or about double the surface tension of water; because tangents to the depressed surface of the water, at the point where the rupture occurs, are vertical.

In the present stage of the research I am inclined to hold the opinion that the flotation of metals and of glass depends on a film of air which is condensed on their surfaces. The following experiments seem to sustain this opinion. If a ring made of platinum wire $\frac{4}{10}$ millimeter thick, which readily floats on water, is heated to redness and as soon as cold is placed on water it sinks. Also, when withdrawn from the water and wiped dry it again sinks when placed on the water; but after the same dried ring remains about a quarter of an hour exposed to the air then it will float. If the platinum ring, after having been heated to redness, remains in the air about a half hour and then is placed on the water it floats.

Glass behaves in a similar manner to platinum. If a rod of glass, recently drawn out in a spirit flame and just cold, is placed on water it sinks. After a freshly made rod has remained exposed to the air about a quarter of an hour it will float. If a recently made glass rod which has just sunk in water be withdrawn, wiped dry and exposed to the air for a quarter of a hour, it will float. The glass rods used in these experiments are one millimeter thick and four to five centimeters long.

Under certain conditions the ratio of the weights required to make a platinum ring break through the surface of water and through the surface of another liquid is the ratio of the surface tension of water and that of the liquid. This ratio is 1 : 1.09 in the case of water and a solution of chloride of sodium of density 1.2. Taking .077 as the surface tension of water we have 1 : 1.09 = .077 : .0839. Platinum is used for such experiments because it is chemically inert to nearly all liquids.

Under certain conditions the ration of the weights required to make a platinnm ring bread through the surface of water and through the surface of another liquid is the ratio of the surface tension of water and that of the liquid. This ratio is 1 : 1.09 in the case of water and a solution of chloride of sodium of density 1.2. Taking .077 as the surface tension of water we have 1 : 1.09 = .077 : .0849. Platinum is used for such experiments because it is not oxidizable and is chemically inert to nearly all liquids.

The relation that the experiments mentioned in this article have to the surface tension of water and other liquids, and to the change of surface tension on the exposure of a liquid to the air, will be discussed in a paper containing a fuller account of facts and theory than can be given in this notice.

ALFRED M. MAYER.

MAPLEWOOD, N. J., August 21, 1896.

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### *A GALL-MAKING COCCID IN AMERICA.*

THE numerous and extraordinary galls formed by Coccidæ in Australia have long excited the interest of entomologists, but so far no gall-making coccid has been de-

scribed from America. It was, therefore, with the greatest surprise and pleasure that I detected some galls produced by a coccid, on the leaves of *Quercus wrightii* at Pinos Altos, New Mexico, on July 8th. The galls were quite abundant and are situated on the midrib on the under side of the leaf, at or near the base; their shape is something like that of a hazel-nut, but flatter on one side, with the midrib continued to form a ridge, terminating in a more or less pointed apical crest. Frequently two galls will be combined in one, in which case there are two pointed crests. On the upper side of the leaf is observed a narrow slit, opening into the cavity of the gall. The cavity of the gall is low-conical and is filled by the dark-colored female coccid.

The coccid, aside from the fact of its forming a gall, is extremely interesting. It belongs to the Idiococcinæ, a group of sixteen known species, all confined to Australia, except one in the Sandwich Islands and one in Japan. It is closely allied to the Australian forms, the larva being very like that of *Crocidocysta*, lately described by Rübsaamen, while the adult resembles certain species of Maskell's genus *Sphærococcus*. It represents, however, a new genus, which I call *Olliffiella*, in memory of Mr. Sidney Olliff, whose lamented death occurred just as he was about to publish on the gall-making coccids of Australia. The genus *Olliffiella* will be known by its adult female having very small but perfectly distinct and well-formed legs and antennæ; the antennæ resembling those of *Coccus*, six-jointed, the joints after the third successively shorter; the femora very stout, semi-circular in outline, the tarsi distinctly two-jointed (a rare but not unique character in coccids), the four digitules all filiform, with small round knobs; the skin of the dorsal surface is thickly beset with glands, mostly double or figure-of-eight. The larva after being treated with potash is reddish-purple, with the legs, antennæ and spines pale yellowish. There are rows of blunt dorsal spines, as in various Coccinæ. The anal ring has distinct but very small bristles; the antennæ are six-jointed, joints 1, 3 and 6 equal in length and longest, 2, 4 and 5 equal and shortest. The caudal setæ are fairly long. The species may be termed *Olliffiella cristicola*, n. sp. At some later date it is intended to give a detailed and illustrated account of it.

T. D. A. Cockerell.

Mesilla, N. M., August 3, 1896.

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### *SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.*

The fourth annual meeting of this Society was held at Buffalo, N. Y., on August 20, 21, 22. Five sessions were held and twenty-one papers were read and discussed. On August 22d there was an excursion to Niagara Falls and Lewiston, under the auspices of the Engineer's Society of Western New York. The following were the officers of the meeting: President, Mansfield Merriman, of Lehigh University; Secretary, C. Frank Allen, of Massachusetts Institute of Technology; Treasurer, J. J. Flather, of Purdue University. The opening address of President Merriman was published in the last issue of Science.

This report of the Committee on Requirements for Admission to Engineering Colleges was presented by the Chairman, Prof. Marvin. This report gives in full the data from both engineering colleges and preparatory schools, collected by the committee during the two years of its labors, as also a careful analysis of the same with conclusions and recommendations. It was advised that a qualitative uniformity seemed desirable in regard to subjects for admission, and a list of such subjects was presented. The reports will be printed in full and opinions thereon be requested from the 350 institutions which have furnished the data.

'A Quartcr Century of Progress in Engineering Education,' by Prof. Robert Fletcher, of the Thayer School of Civil Engineering, was a historical paper which especially set forth the influence of engineering education upon other education, upon the profession of engineering and upon the technical press.

'The Study of Modern Languages in Engineering Courses,' by Dr. T. M. Drown, President of Lehigh University, recommended that after one year of study instruction in technical reading should be given by teachers of engineering, the aim being to accomplish an important practical end in the shortest possible time. After one year of such instruction the author had found that students could read technical books and journals with ease and confidence.

'Biology for Civil Engineers,' by G. C. Whipple, of the Boston Water Works, set forth the advantages of instruction in biology to sanitary engineers. It was thought that this is not less an age of electricity than it is an age of bacteria, and itw as maintained that better sanitation would result from thorough fundamental instruction of the laws governing matter in the living state.

The following are the titles of the other papers read at the meeting:

'Agreement on Definitions of Engineering Terms,' by Thomas Grey, of Rose Polytechnic Institute.

'Seminar Methods as Applied to Engineering Subjects,' by F. P. Spalding, of Cornell University.

'An Experiment in the Conduct of Field Practice,' by F. O. Marvin, of University of Kansas.

'Methods of Teaching Perspective to Engineering Students,' by H. S. Jacoby, of Cornell University.

'A Course of Study in Naval Architecture,' by C. H. Peabody, of Massachusetts Institute of Technology.

'The Elective System in Engineering Colleges,' by M. E. Wadsworth, Director of the Michigan Mining School.

'The Desirability of Lectures to Undergraduates on the Ethics of Engineering,' by C. C. Brown, Civil Engineer.

'Quantity versus Quality in Smaller Colleges,' by Albert Kingsbury, of New Hampshire College of Agriculture and Mechanic Arts.

'The Conservation of Government Energy in Promoting Education and Research,' by C. W. Hall, of University of Minnesota.

'The Hale Engineering Experiment Station Bill,' by W. S. Aldrich, of University of West Virginia.

'Uniformity of Symbols for Engineering Text-Books,' by I. O. Baker, of University of Illinois, being a report of progress of a committee on this subject.

'Is not Too Much Time Given to Merely Manual Work in the Shops?' by W. H. Schuerman, of Vanderbilt University.

'How to Divide Subjects for Original Investigation among Different Colleges,' by C. H. Benjamin, of Case School of Applied Science.

'Credit for Shop Experience in Entrance Examinations,' by W. T. Magruder, of Vanderbilt University.

'A Course of Study in Municipal and Sanitary Engineering,' by A. N. Talbot, of University of Illinois.

'Engineering Education in Japan,' by J. A. L. Waddell, Civil Engineer.

'Modelling as an Aid to Teaching Machine Design,' by G. W. Bissell, of Iowa Agricultural College.

About 25 new members were elected, thus making the total membership over 200, about 85 engineering colleges being represented. Among the guests present was Mr. Surijo Mine, Electrical Engineer to the Japanese government. The number of members in attendance was about 50, and many interesting discussions upon the papers were held. On the motion of Dr.

*Notes on the Determination of Phosphorus in Steel and Cast Iron* (*25m.*). GEO. AUCHY.

*The Development of Smokeless Powder* (*10m.*). C. E. MUNROE.

The afternoons were spent in visiting the several manufactories in the city and vicinity. After transacting the necessary business the session adjourned. The winter meeting will be held at Troy, N. Y.

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### *LILIENTHAL, THE AVIATOR.*

THE death of Otto Lilienthal, the aviator, and the fatal accidents which have been so common of late among balloonists, are likely to check somewhat the work of experimentation in aërial navigation; but it is not probable that it will put a stop to research in this seductive though dangerous field. Necessarily involving experiment at the speed of a railway train, and at considerable heights above the ground, aviation is especially hazardous. Herr Lilienthal, whose death is reported to have occurred August 11th, through the breaking down of his apparatus when at the full height of his flight from the hill at Rhinow, is perhaps the greatest loss that the cause of aviation could at this time experience.

He was the most successful and one of the most enthusiastic of all the many inventors who have entered upon this field of work. He was in the prime of his life, forty-seven years of age, and had already accomplished enough to convince himself and many careful observers of the possibility of artificial flight, once the motor could be found to supplement his apparatus of support. He was a steam-engine builder, and familiar with the available motors, and was confident that only patience, perseverance and skilful engineering were required to insure complete success. A firm believer in aviation, as distinguished from ballooning, he had accomplished so much in the construction of the apparatus of flight, and had succeeded so far in actual, soaring flight that his confidence seemed well justified.

The machine employed was a system of aëroplanes forming wings and a tail; the wings being given a certain curvature, always observed in the wings of birds and which Lilienthal found to be essential to best effect. The material was 'balloon muslin,' impregnated with collodion to make it impervious to air, and stretched upon frames of split osier, and fitted with great care and skill. He was, at the time of his death, experimenting upon carbonic acid and other motors. The weight of his apparatus was from 33 to 55 pounds, as lately constructed (15 to 25 kilos); its area of supporting surface, 10 to 20 square meters. The spread of wing was usually about 23 feet (7 meters). With this machine, Lilienthal insisted that the art of flying might be acquired, or at least that of soaring flight, as readily as that of riding a bicycle. He made thousands of flights without serious accident, and was confident that comparatively little danger was to be anticipated if the method were cautiously learned. His experience indicated, he considered, that the exercise is on a par in this respect with bicycling, for though the latter sport gives rise to daily, and sometimes fatal, accidents, it is rightly commended and encouraged. His experiments confirmed, as he has stated, the deductions of Langley relative to the 'internal work of the air.'

Lilienthal was a frequent contributor to the German technical journals, and wrote a small work detailing his experiments and the methods of construction and operation of his machines.* Expecting to secure some pecuniary advantage, in time, from his inventions, he patented them in this country as well as in Europe.

R. H. THURSTON.
CORNELL UNIVERSITY.

* Der *Vogelflug als Grundlage der Fliegekunst*, Berlin, 1889.

T. C. Mendenhall, the Society adopted a resolution advocating the passage of a law by Congress for the adoption of the metric system of weights and measures.

The following officers were elected for the ensuing year: President, H. T. Eddy, of University of Minnesota. Vice-Presidents, J. Galbraith, of Toronto School of Practical Science, and J. M. Ordway, of Tulane University. Secretary, C. Frank Allen, of Massachusetts Institute of Technology. Treasurer, J. J. Flather, of Purdue University. Councillors, T. C. Mendenhall, of Worcester Polytechine Institute; Robert Fletcher, of Thayer School of Civil Engineering; A. Beardsley, of Swarthmore College; M. E. Wadsworth, of Michigan Mining School; W. H. Schuerman, of Vanderbilt University, and Wm. Kent, Editor of *Engineering News.*

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*THIRTEENTH GENERAL SESSION OF THE AMERICAN CHEMICAL SOCIETY.**

The president, Dr. Chas. B. Dudley, called the meeting to order. He spoke of the large program and proceeded at once to call upon the committee of arrangements.

Dr. Miller introduced Dr. Roswell Park, president of the Buffalo Society of Natural Science, who gave the address of welcome. After making the visitors feel at home, he made a plea to those who were interested in physiological chemistry to produce a substance which should have a germicidal property, so far as the deleterious germs were concerned, and yet not be toxic to the living tissue. With such a substance we could saturate our systems and live secure from the attacks of the deleterious germs. The president replied to Dr. Park's address. After thanking him for his kind welcome, he spoke of the advancement of chemistry in the last few years, and the benefits to be derived from chemists' being united in a society. The reading of papers was then proceeded with. Among the most interesting of the papers read was that of Prof. Kennicott, 'The Inspection and Sanitary Analysis of Ice.' This paper was discussed at length.

The following is a list of the papers read:

*Composition of American Kaolins* (*25m.*). Charles F. Mabery and Otis F. Klooz.

*Composition of Certain Mineral Waters in Northwestern Pennsylvania* (*15m.*). A. E. Robinson and Charles F. Mabery.

*Mercuric Chlor-thiocyanate* (*5m.*). Charles H. Herty and J. G. Smith.

*Zinconium Oxalates* (*10m.*). F. P. Venable and Charles Baskerville.

*Rutheno-cyanides* ( *m.*). James Lewis Howe.

*The Inspection and Sanitary Analysis of Ice* (*20m.*). Cass L. Kennicott.

*The Reduction of Concentrated Sulphuric Acid by Copper* (*8m.*). Charles Baskerville.

*Some Analytical Methods Involving the Use of Hydrogen Di-oxide* (*15m.*). B. B. Ross.

*Notes on the Preparation of Glucinum* (*10m.*). Edward Hart.

*Aluminum Analysis* (*30m.*). James Otis Handy.

*An Analytical Investigation of the Hydrolysis of Starch by Acids* (*30m.*). George W. Rolfe and George Defren.

*The Effect of an Excess of Reagent in the Precipitation of Barium Sulphate* (*15m.*). C. W. Foulk.

*Estimation of Thoria: Chemical Analysis of Monazite Sand* (*15m.*). Charles Glazer.

*Determination of Reducing Sugars in Terms of Cupric Oxide* (*30m.*). George Defren.

*Acidity of Milk increased by Boracic Acid* (*5m.*). E. H. Farrington.

*Accuracy of Chemical Analysis* (*15m.*). Frederic P. Dewey.

*Some Extensions of the Plaster of Paris Method in Blowpipe Analysis* (*15m.*). W. W. Andrews.

*Device for Rapidly Measuring and Discharging a Definite Amount of Liquid* (*5m.*). Edward L. Smith.

*Table of Factors* (*5m.*). E. H. Miller.

*A Modified Form of the Ebullioscope* (*10m.*). H. W. Wiley.

*A New Form of Potash Bulb* (*5m.*). M. Gomberg. Communicated by A. B. Prescott.

*Morphine in Putrefactive Tissue* (*15m.*). H. T. Smith. Communicated by A. B. Prescott.

*The Signification of Soil Analysis* (*10m.*). H. W. Wiley.

*A Complete Analysis of Phytolacca decandra* (*5m.*). G. B. Frankforter and Francis Romaley.

*The Crystallized Salts of Phytolacca decandra.* G. B. Frankforter and Francis Romaley.

*The By-products formed in the Conversion of Narcoline into Narceine* (*5m.*). G. B. Frankforter.

* Buffalo, N. Y., August 21 and 22, 1896.

This publication should stimulate friends of American archæology to contribute liberally to this enterprise, as it abundantly shows that the soil of our own continent offers problems in reference to ancient civilization every whit as interesting as those existing in the valley of the Nile or on the banks of the Euphrates.

D. G. BRINTON.

UNIVERSITY OF PENNSYLVANIA.

## *CURRENT NOTES ON PHYSIOGRAPHY.*

### GULF STREAM AND LABRADOR CURRENT.

PROF. WM. LIBBEY, JR., of Princeton, presented to the Sixth (London) International Geographical Congress, an abstract of the results obtained from serial temperature soundings along the boundary of the Gulf Stream and the Labrador current, made under his direction by the U. S. Fish Commission southward from the New England coast (Lat. 41° to 39°) between Block Island and Nantucket, in the summer months of 1889 to 1892. Surface and deep currents are separately discussed. The former are found to fluctuate with weather changes; the most intimate relation appearing between surface winds and the surface termination of isothermal lines (isothermobaths) on vertical north-south sections. The surface currents are continually swayed laterally, or hurried or retarded by the winds. Smaller and slower shifts of the deeper currents are found; while these effects are not yet definitely correlated with their causes, it is believed that they may be the cumulative results of varying surface impulses. Twenty-one sections are appended, shaded in red and blue to represent differences of temperature. Unfortunately they are without sufficient indication of place, depth or date.

### PREGLACIAL EROSION CYCLES IN ILLINOIS.

O. H. HERSHEY discusses the physiographic development of northwestern Illinois on the basis of personal observations, comparing his results with those found by others elsewhere (Amer. Geol., Aug. 1896). He regards the general upland as a peneplain of Tertiary erosion. It is surmounted by low monadnocks, locally known as 'mounds,' 200 feet or more in local relief; the accordant summits of these eminences are tentatively taken to indicate an almost destroyed ancient peneplain, probably to be correlated with the peneplain of Cretaceous erosion elsewhere recognized. The uplands are interrupted by broad-floored valleys, and these in turn are trenched by narrow valleys, of late Tertiary and of Quaternary date respectively. The narrow valleys are more or less clogged with drift, concerning which several details are given. The drainage lines are interpreted as having been modified from ancient consequent courses by continually advancing adjustment to weak structures in successive early cycles; except that the Mississippi between Iowa and Illinois is thought to have first come into existence after the excavation of the broad-floored valleys in late Tertiary time. Taking 5 as the time needed for cutting the trenched valleys, 25 is given for the broad-floored valleys, 200 for the uplands, and more than 500 for the doubtful ancient peneplain of the monadnock tops; but all this is admittedly very rough. This essay is not only intrinsically valuable for its contents, but interesting as one of the few products of individual work in physiographic exploration; standing in this respect on the same plane with Taylor's studies of the ancient shore lines of our Great Lakes.

### THE PIEDMONT PLATEAU OF VIRGINIA.

THE eighth annual field meeting of the National Geographic Society at Monticello, Va., was the occasion of an address by McGee, on the Geographic History of the Piedmont Plateau (Nat. Geogr. Mag., Aug., 1896). The undulant and mountain-embossed plateau is described as the pene-

## CURRENT NOTES ON ANTHROPOLOGY.

### THE QUESTION OF THE TOLTECS.

In a recent note (Science, July 24) I referred to Dr. Valentini's opinion that the ancient Toltecs belonged to the Mayan stock. This view is advocated also by Mr. E. P. Dieseldorf in an article entitled "Who Were the Toltecs?" in the Bastian-Festschrift, and by Dr. Förstemann in Globus, Vol. 70, No. 3.

The theory of the latter is that at a remote period the Mayan stock occupied North America to about N. Lat. 23°, and extended perhaps to the island of Cuba. They had developed a moderate degree of culture when the Aztecan tribes invaded their domain from the north and west. Tula and Cholula were Mayan settlements, and when they succumbed to Aztecan inroads they dowered their conquerors with a part of their superior culture, notably their mythology. In later times the Mayans were driven southward, the only fragment who managed to remain being the Huastecas of the Rio Panuco. This hypothesis, it is claimed, explains the marvelous legends of the Toltec empire, and also the similarities of culture between the two stocks. Mr. Dieseldorf is so convinced of this that he is sure if we drove a tunnel through the pyramid of Cholula we should reach the primitive Mayan temple which is buried beneath it.

### CLASSIFICATION OF PRIMITIVE IMPLEMENTS.

General culture development is measured by progress in the arts, and for that reason archæologists devote such close attention to the historic development of these. Prehistoric archæology is divided into periods marked by the introduction or discovery of improved methods and materials. Mr. Joseph D. McGuire in the *American Anthropologist* for July proposes a scheme, in some respects novel, for the classification and development of primitive implements. It is five-fold in scope, considering the natural material, the most obvious use to which it would be put, the primitive tool which this would suggest, and then the special and complex tools which would result.

The scheme thus presented is ingenious, well stated and, from our view point, satisfactory. If natural man did not follow it he must have been a fool. Unfortunately, it is almost sure that he was a fool, and that he repeatedly overlooked the most obvious improvements to his condition which were directly under his nose. Perhaps some later dwellers upon earth do the same. Indeed, the tendency is so radical in the race that it is safer to take the facts alone for our guides, and to hold, at least at present, that if there are no polished stones in palæolithic sites early men were stupid enough not to 'catch on' to polishing.

### THE RUINS OF COPAN.

It is generally known that for several years past the Peabody Museum of Harvard has been prosecuting excavations in the extensive ruins at Copan, Honduras. A preliminary report has just been published by the Museum which gives an outline of the work accomplished, and that in view. It is a handsome, large quarto, with numerous illustrations, a map and plans. Further special reports will follow on particular localities.

No one can examine the fifty pages of this publication without being profoundly impressed with the size, bold planning and artistic finishing, which these ancient and unknown architects gave to their constructions. The ornamentation was recklessly profuse, and the cubic mass of materials moved something surprising. The art motives at times are much beyond what we are accustomed to see in native American work, as, for example, the head of the 'singing girl' represented on plate IX.

plained surface of a vast mass of inclined schists, with many dikes and veins, of which an unmeasured upper portion has been worn away; the peneplain being now uplifted and trenched by sharp-cut gorges, 100 to 300 feet deep. Monticello, and Carter mountain with which it is joined, are residual eminences surmounting the undulant peneplain. It is well pointed out that a peneplain like the Piedmont plateau is a better witness to the work of rain and rivers than even the Colorado canyon; for what has been only well begun in the canyon is carried almost to completion in the peneplain. Several historico-geographical essays followed McGee's physiographic address.

NOTES.

THE North German heaths and moors, geographical inheritances of glacial action, are described with particular reference to their flora by Krause in Globus, lxx., 1896, Nos. 4, 5.

THE origin of the Wind Gap in Blue Mountain, Pa., north of Easton, by the diversion of an ancient river to several subsequent branches of the Delaware and Lehigh, finds a recent advocate in F. B. Wright, of Oberlin (Amer. Geol., Aug., 1896).

AN interesting flight of interpretation by O. H. Howarth (London Geogr. Journ., Aug., 1896) treats Popocatapetl and the neighboring volcanoes of the Mexican chain as subsidiary vents, marginal to and later than the Pedregal, a vast flood of uniform basaltic lava that stretches from the Ajusco cone over 200 miles westward nearly to Acapulco. The lava flood is referred to a quiet fissure eruption, while the scoriaceous cones, high as they tower above the Pedregal, are ascribed to explosive eruptions at points where the great body of hot lava encountered accumulations of water. Before the fissure eruption, the North American continent is believed to have ended with the Mexican plateaus.

A GEOLOGICAL and a hypsometrical map of northern Venezuela by Sievers, with explanatory text, appears in Petermann's Mittheilungen, vi., vii., 1896.

THE undersigned has recently published the following essays: The Seine, the Meuse and the Moselle (Nat. Geogr. Mag., June, July, 1896), in which the Meuse is shown to have lost certain branches to its neighbors on the west and east. The Outline of Cape Cod (Proc. Amer. Acad., Boston, 1896), in which the attempt is made to reconstruct the original outline of the terminal portion of the Cape. Large-scale Maps as Geographical Illustrations (Chicago Journ. Geol., May–June, 1896), advocating the introduction of detailed topographical maps in teaching geography, and describing several examples selected from the official surveys of Great Britain, France and Germany.

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*CURRENT NOTES ON METEOROLOGY.*

WORK OF THE WEATHER BUREAU IN CONNECTION WITH OUR RIVERS.

COMPARATIVELY few persons know of the work our Weather Bureau is doing in connection with the rivers of the United States, and fewer still realize the importance of this work. Bulletin No. 17 of the Weather Bureau contains an account of the origin and development of the river and flood system of the Bureau, and of the work that is now being done in this division of the service. The object of this department is to facilitate commerce on navigable streams by publishing daily information as to water stages along the course of each river, and to issue warnings of coming floods. Observations of river stages were made by the United States Engineer Corps prior to 1873, in which year the Weather Bureau formally undertook the work of making daily observations of the height of the water in the principal rivers, these ob-

servations being telegraphed to other river stations and to Washington. Since that time each issue of the *Monthly Weather Review* has contained a summary of the water fluctuations and floods of the principal waterways of the country. The work has been very greatly extended during the last few years, and on January 1, 1896, the stations operated in connection with it were as follows: 135 special river stations equipped with standard river gauges; 44 rainfall stations, so distributed in the various catchment basins as to give, in connection with the regular stations of the Bureau, a fair approximation of the average rainfall over each watershed; 38 completely equipped meteorological stations where river measurements were made, and 22 Weather Bureau stations which were centers from which flood warnings and forecasts of expected changes in river level were issued. Since July 1, 1893, the immediate supervision of the river service and the predicting of river changes for their several districts has been delegated to the various local forecast officials. The importance of the flood forecasts can hardly be calculated, but as one example we note that the warnings of a flood on May 21 and 22, 1894, at Harrisburg, Pa., saved property and live stock of an estimated value of $60,000 to $70,000.

### WINDS OF THE SOUTH ATLANTIC OFF THE COAST OF BRAZIL.

THE August *Pilot Chart of the North Atlantic Ocean* makes clear the January and July wind relations of the South Atlantic Ocean adjacent to the coast of Brazil, by means of two small charts and some explanatory text. The charts are compiled from returns made by volunteer observers of the Hydrographic Office during 1890–95, and show by wind-roses the percentages of the winds that may be expected from the different directions, and the chances of finding calms. The effects of the seasonal changes of pressure over South America are clearly seen. In July (winter) the S. E. Trades are carried southward to the 20th parallel, while in January (summer), owing to the presence of the continental area of low pressure over South America, the S. E. Trades are replaced north of Cape San Roque by N. and N. E. winds, these being the indraft on the eastern side of the low pressure area.

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### *PSYCHOLOGICAL NOTES.*

WITH the exception of the advancement of scientific research there is no subject more important to men of science than the adequate teaching of the sciences in our colleges and schools. The efforts now being made by the Natural Science Department of the National Educational Association to properly coordinate higher and secondary scientific education should be heartily supported, and those who have read in this JOURNAL the addresses by Profs. Bessey, Carhart, Freer, Jordan and Gage, at the recent meeting of the N. E. A., will understand what excellent leadership controls the movement. As a psychologist, interested in the development of the child, its senses and movememts, I wish to urge that scientific education begin with the kindergarten. There are but few things more pathetic than the ignorant zeal of the average kindergarten teacher. I have recently examined the catalogue of kindergarten supplies offered by the Milton Bradley Co., and find it simply abominable. Nearly everything seems especially devised to injure the eyesight and the nervous system of the child. The young child should be taught to concentrate the attention, to observe accurately and to make easily movements not requiring nice adjustments. The best thing he can do is to learn to classify things by their resemblances, to watch plants grow, to take

care of animals, to learn the geography of the schoolhouse, to use tools, to weigh and measure on a large scale. These are the beginnings of science and are the best subjects for the kindergarten.

We begin to ruin the eyesight of children in the kindergarten and continue to persecute them until the end of the college course. Some time since I wished to find an edition of *Homer* for my own use, and after examining about twenty editions could not find one that I regarded as properly printed. If children are legally forced to attend the public schools, and their eyesight is injured by long sessions, badly printed books and badly lighted and ventilated rooms, could they not bring suit for damages against the State or district that has forcibly injured them? My own progressive myopia and accompanying headaches were caused by private schools, and I have no redress; but if some public spirited man of science would bring suit against the proper body, the result, whether damages were allowed or not, would be most useful.

What we need is a scientific study of the conditions of fatigue in reading, and a step in this direction is made by a research from the psychological laboratory of Columbia University by Dr. Griffing and Mr. Franz, to be published in the September number of *The Psychological Review*. Starting from a research of my own (*cf.* Science, O. S., Vol. VII., p. 128), on the legibility of the letters used in printing, the authors investigate the size and style of type, the color and quality of paper and the illumination. Type should not be less than 1.5 mm. in height; it should be leaded, and the illumination of the printed page should not be less than 100 candle-meters. Yet most school books are printed in small type, without leads, on poor or glazed paper, and the illumination in many school rooms is less than 2 candle-meters. I found the relative legibility of the small letters to be in the following order: d k m q h b p w u l j t v z r o f n a x y e i g c s. Thus some of the letters most frequently used are among the most illegible. The letters used in printing were developed from those used in writing, and these were evolved in accordance with the convenience of the writer, not for the advantage of the reader. Now that we write chiefly with the printing press, it is absurd to retain symbols whose legibility would be greatly improved by a slight modification.

It is often said that psychology has no practical applications, but another article will be found in the September number of *The Psychological Review* of general interest. Prof. Patrick and Dr. Gilbert, of the University of Iowa, have kept three observers awake during ninety consecutive hours. The anti-vivisection societies might expect to find enlarged usefulness in the psychological laboratory, but it happened that the observers suffered in no wise from the 'fast,' although dogs die if kept awake four or five days. Careful records were taken of the physical and mental condition of the observers during and after the enforced insomnia, and the results are of the greatest interest, scientifically and practically.

Dr. J. Paul Goode and Mr. Oliver C. Farrington have done well to call attention (Science, Vol. IV., p. 115 and p. 271) to absurdities in the illustrations of school books. I must, however, take exception to the view that mountains should be reproduced as they would be represented in a geometrical drawing or in a photograph. Mountains look higher than the angles they subtend, and should be represented as they look. Colors in a landscape are not what each would be apart from the rest. The Greeks knew very well that architecture should be psychological, not geometrical, and now that there is a science of psychology, architects and artists should study

it. It is often said that since we have instantaneous photographs of animals in movement, these should be reproduced by the artist. But this is incorrect; art is concerned not with physics but with psychology.

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COLUMBIA UNIVERSITY.

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## *SCIENTIFIC NOTES AND NEWS.*

### THE AMERICAN ASSOCIATION AND 'SCIENCE.'

THIS JOURNAL was established in 1883 by Mr. A. Graham Bell, who, in conjunction with Mr. Gardiner G. Hubbard, spent more than $80,000 in its support. The loss was so large and continuous that the generous donors were compelled to withdraw their aid, and publication was suspended early in 1894. At the Brooklyn meeting of the American Association for the Advancement of Science, in August, 1894, it was thought that the continuation of such a journal was so important for the advancement of science in America and for the welfare of the Association that an arrangement for cooperation between SCIENCE and the Association was effected and unanimouly adopted in the general session of the Association. The JOURNAL agreed to publish part of the papers read before the Association, and the Association appropriated on certain conditions $750 annually toward the support of the JOURNAL. In view of the moral and financial support of the Association, and by securing an editorial committee and a responsible editor who would serve without compensation, the JOURNAL was reorganized and the publication of a new series was begun in January, 1895.

The JOURNAL has had the generous support of the leading men of science in America. The general character of its contents may be judged from the following presidential addresses which it has been able to publish since the first of January of the present year:

President Morley, before the American Association for the Advancement of Science.

President Cope, before the Society of American Naturalists.

President Shaler, before the Geological Society of America.

President Dwight, before the Association of American Anatomists.

President Hill, before the American Mathematical Society.

President Gilbert, before the Geological Society of Washington.

President Dall, before the Philosophical Society of Washington.

President Rees, before the New York Academy of Sciences.

President James, before the Society for Psychical Research.

President Bowditch, before the Massachusetts State Medical Society.

President Bessey, before the Natural Science Department of the National Educational Association.

President Merriman, before the Society for the Promotion of Engineering Education.

President Trelease, before the Botanical Society of America (in press).

At the Springfield meeting of the Association the subsidy mentioned above was paid to SCIENCE, and the money has been spent in its enlargement. Unfortunately recent meetings of the Association have been small, and it was necessary to take the money from the invested funds of the Association. The meeting at Buffalo last week was even smaller than that at Springfield, and it was believed by friends of the JOURNAL and of the Association that it would be undesirable to use further for any purpose, however important, the invested funds of the Association. But it was hoped that enough members of the Association would subscribe to the JOURNAL to make up the amount of the subsidy promised at Brooklyn.

We have not hitherto mentioned the business affairs of the JOURNAL in its pages, but the editorial importance of its continued efficiency makes it desirable to do so on this occasion. SCIENCE will not be abandoned, even though its continuation may entail serious financial sacri-

fices on the part of a few. We venture, however, to ask those members of the Association who can to subscribe to the JOURNAL. Some of those who are already subscribers may be willing to make one or more additional subscriptions to be used in sending the JOURNAL to members of the Association who cannot themselves afford the subscription.

## GENERAL.

THE Paris Academy of Sciences undertook, on the occasion of the Hundredth Anniversary of the death of Lavoisier in 1894, to erect a monument in his honor. An international subscription was opened, and the Academy has just published the subscriptions received up to August 1st of the present year. The names of the subscribers fill fifty pages, the sum so far collected being 47,553.30 fr. We note that the Academy is not without patriotism. Alsace is given the rank of one of the leading nations, being placed between France and Germany. It is a matter for great regret that only the small sum of 500 fr. has been subscribed in the United States, and of this one-fifth is from a zoologist, one-fifth from an electrician and one-tenth from an economist. The subscription is not yet closed, the French Minister of Public Instruction, the City of Paris, the Emperor of Russia and other individuals and institutions intending to assist. It is consequently not too late for subscriptions to be forwarded from America, and it is much to be hoped that the American Chemical Society will undertake to see that America is better represented than a country such as Servia on the final list.

*The Critic*, which early in the summer published a list of large gifts to American colleges, gives in its current issue from official sources a corresponding list of large gifts and bequests to libraries. The largest of these are as follows: New York Free Library, from members of the Astor family, about $1,650,000; from James Lennox, $735,000, in addition to books and land; from the Tilden estate, $2,000,000; John Crerar Library, of Chicago, from the founder, about $2,700,000; Newberry Library, of Chicago, from the founder, about $2,500,000; Carnegie Library, of Pittsburg, from the founder, $2,100,000; Enoch Pratt Free Library, of Baltimore, from the founder, about $1,080,000; Library Co., of Philadelphia, from the founder, Dr. Rush, about $1,060,000; President Low's gift of $1,000,000 for the Library of Columbia University is omitted from the list.

PROF. W. A. HERDMAN has contributed to *Nature* a further account of the arrangments for the approaching meeting of the British Association. Programs of the excursions arranged for four of the sections are given, and an article on the scientific work of the sections is promised for the following week. The Local Secretaries hope to secure Dr. Nansen's presence at the meeting. Before he sailed in the *Fram*, Nansen promised a Liverpool shipowner that he would visit him immediately on his return. He has now been reminded of that promise by telegram to Vardö.

THE American Social Science Association met at Saratoga, beginning on Monday evening, August 31st. The program is a strong one, demonstrating most clearly the needless weakness of Section 'I' of the American Association. Steps should be taken to secure, if possible, an affiliation between the Social Science Association and the American Association.

THE death is announced by cablegram of Nicolas Rudinger, professor of anatomy at Munich. He was sixty-four years of age. We also learn with regret of the death of Dr. H. E. Beyrich, professor of geology and paleontology, at Berlin.

ACCORDING to *Popular Astronomy*, Professor A. Hall, Jr., director of the observatory of the University of Michigan, has secured an extensive series of observations of Polaris for latitude variation. He is also engaged on the division errors of the meridian circle, as no examination of the errors has been made for a long time.

WE are glad to notice, in *Appleton's Popular Science Monthy* for September, the beginning of a series of articles on 'The Vivisection Question,' by Prof. C. F. Hodge, of Clark University. Prof. Hodge is, himself, making experiments on the lower animals which alone will probably alleviate more human and animal suffering than has been caused by all the vivisection experiments that have ever been made.

MR. SAMUEL H. RANCK, of the Enoch Pratt Free Library, Baltimore, calls our attention to articles in the students' journals of Franklin and Marshall College, advocating the use of metric units in college athletics. This is an excellent idea, as very few things would tend more quickly to familiarize the public with the units, and owing to the probable extension of international contests the students of our colleges might favorably consider the plan.

REFERENCE was recently made in these notes to the fact that the decimal system of numeration had its origin in man's having ten fingers. According to the *Revue Scientifique* the *Bibliographie générale de l'astronomie* calls attention to the fact that this was suggested by Aristotle (*Problemata*) and that there are languages in which five and hand are expressed by the same word. It is certainly unfortunate, so far as enumeration and measurement are concerned, that man did not originally have twelve fingers.

WE may reply to Mr. Josephson's letter (see page 315 below) that we have already published a large number of contributions regarding scientific bibliography and should be glad to have others of equal value. The JOURNAL is fortunate in having on its editorial committee Dr. G. Brown Goode, of the Smithsonian Institution, and Dr. John S. Billings, head of the New York Consolidated Libraries, both of whom are eminent authorities on the subject. Dr. Billings and Prof. Newcomb (also of the editorial committee) were the delegates from the American government to the recent Bibliographical Conference in London.

THE New York *Evening Post* states that Prof. C. W. Dodge, of the biological department of the University of Rochester, has asked the trustees to make an appropriation for the establishment of a biological laboratory at Hemlock Lake, a small lake thirty miles south of Rochester, from which it obtains its water supply. He proposes to make a complete biological survey of the lake and to utilize the services of the expert students in his department for the work.

ACCORDING to the *Electrical World* there were about 200 delegates present at the International Congress of Electricians which was opened in the Aula of the Geneva University, on Tuesday, August 4th. M. Turrettini presided and papers were read by Dr. Weitlishbach, on 'Telephonic Disturbances caused by Electric Traction;' by M. Hospitalier on 'Magnetic Units;' and by M. André Blondel on 'Photometric Units.' Among the subjects discussed was the question of transmission of power over long distances, and practical exhibitions of its transmission were made at the exposition.

THE War Department has sent to Paris for a set of the Bertillon instruments, and a thorough examination will be made into the system of identification with a view of introducing it into the United States army.

A MOUND has been explored at McKee's Rocks, near Pittsburg, by Mr. Thomas Harper and found to contain stone and bone implements and skeletons which are said to be of special interest and will be deposited in the Carnegie Museum.

SIBERIAN exiles are supposed to suffer peculiar hardships, but the St. Petersburg correspondent of *The Lancet* states that last year an old peasant named Ivan Kouzmin was reported to have traveled from Moscow to Kief at the age of 140. He was said to be in good health; he had formerly been a coachman to Count Sheremétief, but in 1840 was sent to Siberia, where he spent fifty-four years, returning in 1894. His is not the only instance in which a Siberian exile has survived to extreme old age. Two years ago there was said to have died in Samara one Lavrentii Efimof, who had attained the age of 150. According to the newspaper report of him he took part as a boy in the famous Pugatchef rebellion in the reign of Catherine the Great, and for his share in that outbreak spent thirty years of his life in Siberia.

IT is reported in the daily papers that a cave, said to be the largest in the world, has been discovered near Hudson, Mo. In the *Scientific American* of August 29th, Mr. H. C. Hovey gives an interesting description of the cave discovered by Mr. Pike Chapman in July of last year; this is one of a number of caves found in the vicinity of the Mammoth Cave and appears to be of considerable importance. It must be

entered through the tip of a subterranean dome by means of ladders, and the lowest level of the cavern is 250 feet below the entrance. There are a number of fine domes, and passageways miles in extent. The effect is said to be very fine, as the crystals have not yet been injured by the smoke of lamps and fireballs.

American students will be interested in an article in *Science Progress* for August, on 'Petrology in America,' by Mr. Alfred Harker, of St. John's College, Cambridge. The author gives an account of the results of some thirty-seven investigations. The author writes:

"The material for study offered to the American geologist is rich in many respects, and perhaps in no branch richer than in petrology. The vast tracts of Tertiary lavas along and to the west of the Rocky Mountains, the peculiar igneous rocks on the east side of the great watershed, the varied series of lavas, tuffs, and intrusive masses in the Palæozoic and older formations of the Eastern States, the extensive areas of igneous and other crystalline rocks in the Lake Superior region, the Adirondacks, Canada, etc., all present many points of interest, and much valuable work has already been done in the description and study of these rocks. These results we owe in large part to the United States Geological Survey and that of Canada, and to various State surveys; Minnesota, New York, Arkansas, Texas, etc. Besides this official work, systematic petrographic research has been carried on at several universities and colleges, such as Johns Hopkins, Columbia College, Yale, the University of California, and others."

Another paper of interest to American geologists in the same journal and also by a member of St. John's College, Mr. Philip Lake, is on 'The Work of the Portuguese Geological Survey.' The official *Communicaçõef da Direcção dos Trabalhos geologicos de Portugal* may be difficult reading for many (although a large part of the memoirs has also been published in French) and Mr. Lake's account of the recent work of the survey, which is of very considerable importance, is thus opportune.

M. Henri Moissan has reported to the Paris Academy that he has found, in disintegrated rocks from Brazil, microscopic diamonds, both black and transparent, and that they were in connection with graphite.

Students of primitive culture are inclined to attribute a wider and wider extension, as their knowledge of early conditions increases, to the matriarchal system of the family. Prof. E. B. Tylor, in the *Nineteenth Century*, reaches the conclusion that it has existed, in either a complete or a partial form, among about half of known peoples of the lower culture. Attention should be called in this connection to an important book on the subject by Mrs. Gamble, which was issued by Putnam two years ago. Prof. Tylor attributes the decadence of the custom to the spread of exogamy, which latter practice gave the tribes which adopted it an advantage on account of its cementing friendship and preventing fighting among larger and larger bodies of men. He mentions the curious fact that a Methodist missionary among the Maoris has lately been inculcating exogamy among his people with this same end, and with very good results.

C. L. F.

At the recent International Psychological Congress at Munich, Mr. George M. Stratton, of the University of California, reported some interesting experiments on vision without inversion of the retinal image. An optical instrument with lenses appropriately arranged produced such an image, and at the same time excluded from the eyes all rays except those coming through these lenses. This instrument was worn on the eyes without intermission (except at night, when the eyes were blindfolded) from three o'clock in the afternoon of the first day until noon of the third day. The experience was somewhat as follows: all visual images seemed at first inverted and illusory. The things themselves were thought of as being, not where now seen, but where they would probably appear could normal vision be restored. Later, however, the present visual presentations seemed 'real.' Objects outside the field of vision began to be mentally represented in terms of the new abnormal vision; they were pictured as they would appear if the present visual field were moved or widened to include them.

At the meeting of the Paris Academy of Science on August 17th, M. Weinek exhibited a further series of photographs of the moon, the negatives having been in part taken at the Lick Observatory and in part at the Observa-

tory of Paris. The enlargement is such as to give a diameter to the entire disk of the moon of more than three meters and, as the photographs are 30x24 cm., there are a large number of separate sheets. The definition in these photographs is said to be admirable.

THE ethics of quotation without assigning the source of the information are somewhat complex. We aim always to give credit to its source when we take a note from a journal that has in fact or apparently received the information at first hand. Our excellent contemporary, the *Revue Scientifique* does not seem to adopt this point of view, but finds SCIENCE of weekly use. In the current number it goes so far as to take from *Nature*, without credit, an account of Mr. Lindenkohl's observations on the Gulf Stream, (which *Nature* properly credited to SCIENCE), but states quite correctly (as quoted by *Nature* from this JOURNAL), that this apparently original information *will* be published in a report of the U. S. Coast and Geodetic Survey.

IN *Appleton's Popular Science Monthly* for September will be found an article by President David Starr Jordan, entitled 'The Sympsychograph,' the contents of which are even more extraordinary than its title. The writer of this note was at first under the impression that the article was intended as a parody on newspaper literature regarding X-rays and psychical research, but this will certainly not be the opinion of readers of the *Monthly*. President Jordan's first paragraph is as follows:

"The Astral Camera Club, of Alcalde, was organized in November, 1895, for purposes of scientific research through the medium of photography. The function of the club was the cooperative study of man's latent psychical powers, that these might be helpful in the conduct of life. No powers granted man should be neglected or allowed to waste in idleness. Just as the great physical force of electricity remained for centuries hidden and known only by casual and unimportant manifestations, so the great odic forces within man are still scantily revealed. The method of the club in Alcalde was to be that of the most rigid scientific research. It was to take up, one after another, the discoveries of our eager century as they were made known to the world through the medium of the daily newspaper. To these were to be added those suggestions which alert intuition and psychic practicality would naturally suggest. No hypothesis in science was to be rejected beforehand, and no prejudice was to stand in the way of the reception of any new theory that might contain a living truth."

President Jordan then proceeds to describe the alleged photographs of the retina by Messrs. Rogers and Lee, and states that their full significance was first brought out at a meeting of the Astral Camera Club on April 1st: "The supremacy of mind over matter, already indicated in a hundred ways, was thus splendidly illustrated. As a thousand miles of ether may be made to vibrate, at the command of the will of the psychic adept, so may the grosser forms of matter be shaken or removed when this subtle and resistless force acts upon it."

Later in the article will be found a description of an experiment made with an instrument exhibited by Mr. Marvin, the president:

"He had devised a camera with a lens having curved facets arranged on the plan of the eye of the fly. To each one of the seven facets led an insulated tube provided within by an electric connection, so that electric or odic impulses could be transferred from the brain or retina through the eye of each different observer to the many-faced lens. From the lens these impulses would be converged on a sensitive plate, as the rays of light are gathered together in ordinary photography. From the members of the Camera Club, seven of those having greatest animal magnetism and greatest power of mental concentration were chosen for the experiment. Connection was made from the eye of these observers to the corresponding parts of the lens; then all were to remain in utter darkness and perfect silence, each person fixing his mind on a cat."

The composite 'psychograph' of the cat is reproduced "in advance of the publication of the regular bulletin of the Society in which the apparatus used is figured in detail." We must admit that we may need at any time to begin our science over again from the beginning, but President Jordan and the editors of *Appleton's Popular Science Monthly* take great responsibility in dating this from a meeting of 'The Astral Camera Club.'

WE regret to criticize a second article in *Appleton's Popular Science Monthly*, a journal which accomplishes so much for the diffusion of scientific knowledge, but an extended editorial article on the speech by Lord Kelvin, on the occasion

of the recent Jubilee Celebration (printed in SCIENCE, IV., p. 68) appears to be very unfortunate. Lord Kelvin said finely:

"But when I think how infinitely little is all that I have done I cannot feel pride; I only see the great kindness of my scientific comrades and all of my friends in crediting me for so much. One word characterizes the most strenuous of the efforts for the advancement of science that I have made perseveringly during 55 years; that word is failure. I know no more of electric and magnetic force or of the relation between ether, electricity and ponderable matter, or of chemical affinity, than I knew and tried to teach my students of natural philosophy 50 years ago in my first session as professor. Something of sadness must come of failure; but in the pursuit of science inborn necessity to make the effort brings with it much of the *certaminis gaudia*, and saves the naturalist from being wholly miserable, perhaps even allows him to be fairly happy, in his daily work. And what splendid compensation for philosophical failures we have had in the admirable discoveries by observation and experiment on the properties of matter, and in the exquisitely beneficent applications of science to the use of mankind with which these 50 years have so abounded!"

We are informed that this is 'a false note' and 'false sentiment.' We are told that Lord Kelvin ought to have said:

"Science in my day has been most prolific of blessing to mankind; it is proceeding apace with its appointed task of enabling men to understand *for practical purposes* the world in which they live, and what shall be the limit to its achievements in that direction no one can foretell. As to the 'riddle of the universe,' of which we sometimes hear, that lies beyond its ken; only when thought ceases to be conditioned will that riddle—not be read but—disappear."

Lord Kelvin has doubtless also read Mr. Spencer's works, and in any case was not regretting that he had not seen the Holy Grail by means of fasting or 10 grs. of hashish. It was a fine thing to acknowledge in the presence of those who had gathered to celebrate his contributions to science and invention that he had failed to learn what he most desired to teach 'the relation between ether, electricity and ponderable matter.' We remember the reply of the savant when asked a certain question, "Madame, I do not know." "Then what is the use of your science?" "Madame, to be able to answer, 'I do not know.'"

## *UNIVERSITY AND EDUCATIONAL NEWS.*

THE chemical laboratory building at the University of Illinois was destroyed by fire on August 17th. The building was three stories high above the basement and contained five laboratories. It was one of the largest and best of its kind in the country and was erected at a cost of $40,000. The fittings, apparatus and supplies are estimated to have brought the entire value to $75,000. The *Scientific American*, from which we take this item, states that it is supposed that the laboratory was struck by lightning, but it seems possible that this, like the recent fire, in the Harvard chemical laboratory, may have been due to spontaneous combustion of chemicals.

IT is commonly supposed that Princeton is 'a rich man's college.' The authorities of the University have, however, issued a pamphlet entitled 'The Cost of an Education at Princeton,' showing that of 54 honor men nearly three-fourths expended only $500 or less annually, and nearly one-half $400 a year or less.

ACCORDING to the *N. Y. Evening Post* the Marquis of Bute has signified his intention of contributing £10,000 to the University of South Wales, to be applied to the purposes of technical education in Wales. The Drapers' Company has also promised £10,000 towards the fund for providing new buildings, and the British government has promised £20,000 on condition that an equal amount be raised by public subscriptions.

WE learn from *Nature* that the Technical Education Board of the London County Council has addressed a letter to the Councils of University and King's Colleges on the subject of the financial assistance to these institutions during the forthcoming session. It is pointed out in this letter that the Board cannot undertake to ensure regular annual grants towards either of these colleges. It is further recommended that the Councils of the two colleges should confer together before making any application for assistance, with a view of coordinating the work now specially carried on in connection with Oriental languages. A question has been raised regarding King's College, as to

whether the Board can legally make a grant to an institution of a denominational character. But since the discussion of these questions will take some time, it is proposed to continue the grants of £1,500 to University College and £1,000 to King's College for next year, on the understanding that such a conference shall be held.

PROF. W. DAMES has been appointed successor to the late Professor Beyrich in geology and paleontology at Berlin, and will also have charge of the collections in geology and paleontology in the Museum of Natural History.

DR. WILHELM WIEN has been promoted to an associate professorship of physics at Berlin.

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## *DISCUSSION AND CORRESPONDENCE.*

### THE DEWEY DECIMAL CLASSIFICATION AND SCIENTIFIC CLASSIFICATION.

TO THE EDITOR OF SCIENCE: Every one who hopes for any good results from the bibliographical conference held this summer in London must be pleased to learn that that body did not see its way to adopt the decimal classification as a foundation for the system to be used in the proposed international index to scientific literature. To adopt that system, even with modifications, would undoubtedly have resulted in a deadlock for the whole science of bibliography, and would have lessened, in a very considerable degree, the usefulness of the international bibliography scheme. And more—it might, if such a thing could be possible, have hampered the progress of science as a whole, as far as scientific work is dependent on the sources of information and the methods of making these sources available.

It is ludicrous to see how certain Belgian, and, surprisingly enough, also English, supporters of the decimal classification are full of enthusiasm over this so-called 'new scientific language,' which is destined to take the place that was held by Latin in olden times. As one of these enthusiasts at great length explained: 'Värme' is a Swedish term, 'Chaleur' is French, 'Heat' is English, and you must know these different languages to be able to make out what these terms mean. But if you write down the magical formula '536,' then, of course, all the world knows everything about it! But if the treatise on '536' should happen to be written in Japanese, and you do not know that language, would you be any happier, if these three figures were written on the top of the title-page?

No completely satisfactory scheme for the classification of the sciences has ever yet been made, and very likely never will. Science is ever progressing, and with each step it knocks some part of your system upside down. And the solution is *not* found by letting odds be even and deciding for all time that '536' shall always mean 'Heat.'

The decimal classification is now being discussed from both sides in French and German bibliographical publications,* and it might result in clearing up the subject of classification as a whole, and in the laying down of some foundation for a flexible scheme that might be used in the international index. And if that be so, the enthusiasts in Bruxelles have done a good work, even if not exactly in the direction they meant.

Some features of the decimal classification might be retained, namely, first of all, the use of decimals, and, perhaps, the form divisions. But the scheme itself is too hastily made up, and contains too many blunders, to be used as it stands, or even as a foundation for the scheme itself.

I suppose there are very few libraries of any consequence that have adopted the scheme unreservedly. It would be interesting to know the standing of those 1000 American libraries using the system that were spoken of in the Bulletin of the *Institut International* in Bruxelles. In the two libraries, where it was first used, Amherst College and Columbia University, it has all been made over again.

It has never been perfectly clear, I think, whether it was devised as a system for arranging books on the shelves of a library, or as a scheme for the classification of knowledge. If you attack it on the grounds of its failure in libraries, its advocates explain that it is mainly a means of classifying knowledge, and *vice versa!*

* The favorable part of the discussion was reviewed at some length in the last number of the *Library Journal*, but it was only mentioned that there was some dissent.

The subject of scientific classification is a very important one, and it is well to know that it is in as good hands as those of the committee of the London Conference. But while this committee works, others do not need to sleep. The science of classification, and of bibliography generally, has no representative in this country, neither a society nor a periodical. The *Library Journal*, 'chiefly devoted to Library Economy and Bibliografy,' is really devoted exclusively to the former. The few short contributions to bibliography that have appeared there of late have been of small consequence, and perhaps naturally so. The librarians are confronted with many practical questions of administration that urgently need solution, and have little time to devote to mere theoretical questions. But there is certainly not only room, but need, for some center for the study of bibliography proper, and more particularly, classification. It is too late now to make any proposition for forming a section of bibliography at the Buffalo meeting of the American Association. But, in the meantime, would not the editor of SCIENCE consider the establishment of a department for bibliography in the columns of this JOURNAL? If the men who work in this field could have such an intellectual meeting place they might by and by find their way to meet and organize for work.

AKSEL G. S. JOSEPHSON.
THE JOHN CRERAR LIBRARY, CHICAGO.

## METEOR OR BIRD?

TO THE EDITOR OF SCIENCE: In your issue of July 31 (p. 140), quoting from the daily press, it is stated that Mr. William R. Brooks, Director of Smith Observatory, while observing the moon recently, saw a dark, round object, believed to be a meteor beyond the earth's surface, pass slowly across the moon's surface in a horizontal direction. Is it not possible that this 'object' may have been a bird?

Few astronomers, in my experience, are aware of the number of nocturnal migrating birds that may be observed under proper conditions. If, during the September migration, a comparatively low-power glass is focused on the full moon, at certain elevations, it is probable that an almost continuous stream of migrants will be seen passing through the narrow angle subtended by the moon's limbs. Thus at Tenafly, N. J., on the night of September 3, 1887, in the observatory of the late Mr. J. F. Panlison, Mr. John Tatlock, Jr., and myself, using a 6½-inch equatorial, saw no less than 262 birds between the hours of eight and eleven. (*Auk.*, V., p. 37.)

Several years later we obtained nearly similar results from the observatory of Columbia University, New York City, where, thanks to the courtesy of Professor Rees, we were permitted to use a glass, the finder of the large telescope proving strong enough for our purpose.

Previously, observations of this kind had been made at Princeton, N. J., by Mr. W. E. D. Scott and Prof. C. A. Young, in October, 1880, and April, 1881. On the first named date four and one-half birds were recorded per minute, for a period not stated; on the latter date thirteen birds were noted in three-quarters of an hour. (Bull. Nutt. Orn. Club, VI., pp. 97, 188.)

The spring migration of birds begins in this latitude in February, reaches its height early in May, and is concluded by June 10th. The fall migration begins about July 1st, reaches its height in September, and is not concluded until December. It is evident, therefore, that an observer of the moon is likely to have birds cross his field of vision at almost any time of the year, though the movement can be studied with greatest profit during the September migration, when the heavens are, doubtless, more thronged with birds than at any other time.

It happens that we are now on the eve of this great flight of feathered meteors, and astronomers who have the time and inclination to focus their glass on the moon this coming 21st of September can render an important service to ornithology.

In the first place, their observations would throw much light on the question of 'highways of migration.' It is generally accepted as a fact that birds are guided in their nocturnal journeys by the topography of the land over which they are passing, and that river valleys and coast lines are the most frequented pathways. The results obtained by observers situated within the limits of the same wave of migration would have a direct bearing on this subject.

But a more important question to determine, and one about which much less is definitely known, is the height at which these night-flying birds migrate. Both Messrs. Scott and Young, and Mr. Tatlock and myself, solved this problem by a hypothetical assumption of the inferior and superior distances at which a bird would be visible. In this way we arrive at the conclusion that the birds seen were between one and three miles above the earth. There is much confirmatory evidence of the truth of this supposition. For instance, Mr. R. A. Bray records in *Nature* (Vol. 52, p. 415) a flight of birds observed by him through a telescope directed toward the sun, at 3 p. m., on September 30, 1894, at Shere, Guilford, England. The birds were invisible to the naked eye, but must have been at least two or three miles away, as both birds and sun were in focus.

Additional observations are needed, however, before this matter can be considered as satisfactorily settled. If, by experiments made during the day, the observer can ascertain with exactness the lesser and greater distances at which a bird would be visible through a glass focused on the moon, and the appearance of a bird at a known distance, he would then have established some basis for comparison of the observations made at night.

It is also of importance to note the time occupied by the bird in crossing the moon's face. This varies greatly; some birds appearing as a mere flash of wings, while others are silhouetted against the moon with great distinctness, and are in the field for several seconds.

Assuming that small birds migrate at the rate of about forty miles an hour, and that they pass through the field at right angles to the line of vision, we have here a means of determining approximately the width of the angle at their point of crossing and consequently, in connection with the moon's elevation, their height above the earth.

FRANK M. CHAPMAN.
AMERICAN MUSEUM OF NATURAL HISTORY.

## CURIOUS FREAK IN AN APPLE TREE.

SOME very curious apples were found last year in an orchard about a mile north of Lake Erie. The apples on the northeast side of a certain tree were Rhode Island Greenings, such as the tree had always borne, while those on the southwest half of the tree were of a mixed character, each apple being partly Greening and partly Talman Sweet.

The different kinds occurred in sections, for the most part corresponding to the carpels. In some, three sections or three-fifths were Greening and two-fifths Talman Sweet, while in others the proportions were reversed. In others one-fifth was Greening or Talman Sweet, and in others again the proportion of Talman Sweet was still less.

The different parts were in most cases easily distinguished by color and by the greater protuberance of the Greening as forming part of a larger apple. The flavor of the parts was as purely Greening or Talman Sweet as if they had belonged to separate apples on separate trees, except where the two came together.

The line of demarkation between the parts, though not very definite, corresponded in most cases with the divisions between carpels, and ran from base to summit, except that a small part round the summit seemed in all cases to be Greening. Sometimes a portion of Talman Sweet was found wedged in at the base of a segment, extending only about half way to the summit.

A short distance to the southwest of this tree stands a Talman Sweet tree; and there can be no reasonable doubt that the phenomenon arose from cross-fertilization between the pollen of the Talman Sweet and the ovule of the Greening. It is difficult, however, to see why the pollen, which acts directly upon the ovule, should so profoundly affect the receptacle and calyx, which make up the fleshy part of the apple. Equally difficult is it to understand why cross-fertilization, which must frequently occur in apple trees, should in one instance produce mixed fruits, and in a thousand cases produce no appreciable effect whatever. Perhaps some of the readers of SCIENCE can throw light upon the subject.

T. H. LENNOX.
WOODSTOCK, ONT.

I HAD the privilege of examining samples of the apples of which Mr. Lennox writes, and

they bore what seemed to me and my associates to be incontrovertible evidence of the immediate effect of cross-pollination. I had never before been convinced that such immediate effect in flavor and other varietal characteristics can occur in the apple, but I am now satisfied that it may occur; but, like heredity of mutilations, it is certainly rare and therefore apparently exceptional.

L. H. Bailey.

Cornell University.

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## SCIENTIFIC LITERATURE.

*The Florentine Painters of the Renaissance with an Index to their Works.* Bernhard Berenson. New York, G. P. Putnam's Sons. 1896. Pp. 141.

This little handbook, by an accomplished student of art history, deserves notice in these pages because it is the first attempt we have seen to apply elementary psychological categories to the interpretation of higher works of art. A painting, says the author, is of only two dimensions and yet must suggest the third dimension to the spectator's mind. The artist to do this, must give *tactile values* to retinal impressions. "It follows that the essential in the art of painting * * * is somehow to stimulate our consciousness of tactile values, so that the picture shall have at least as much power as the object represented, to appeal to our tactile imagination." From Giotto onwards, the Florentine painters preeminently did this, so that the phrase 'tactile value,' instead of the more familiar word 'form,' appears on every page of Mr. Berenson's account of their characteristics. The high pleasure derived from tactile values artfully portrayed would seem to be due to the rapidity and intensity with which they are suggested. The tactile aspect of reality is actually 'heightened' by the picture, and thereupon ensues the secondary enjoyment of our own capacity for the enhanced experience. The rendering of movement is a step farther in the same direction; we feel the motor life of the figure in ourselves and a heightened sense of our own capacity results. To say that pictures have a 'life-communicating value' is thus to sum up the explanation of their effect on us from this point of view.

The essay is charmingly written, and will be useful to all art-students. Whether we get much deeper into the secrets of art-magic, or account for the sense of preciousness that some paintings diffuse, much better on Mr. Berenson's terms than on more familiar ones, may be left an open question. Mr. Berenson himself has to add 'spiritual significance' to his other terms of 'life-enhancing value.' But until we can define just what the superior 'significances' are, in the better of two good pictures—and surely we hardly ever can—the explanation of all merit by significance remains somewhat unsatisfying. The better picture remains simply the better picture, and its ultimate superiority might, in the end, be a matter of immediate optical feeling and not a matter of extraneous suggestion or significance at all.

W. James.

Harvard University.

*Atlas of Nerve-cells.* By M. Allen Starr, with the cooperation of Oliver S. Strong and Edward Leaming. LIII. Plates, 13 diagrams, pp. 79, 4to. Macmillan & Co., 66 Fifth Avenue, New York. 1896. Price, $10.

This latest volume from the University press of Columbia University contains much more than the preface indicates.

A short preface serves to explain the nomenclature employed. The nerve cell is designated as a neuron. It has protoplasmic branches as dendrites and the pin-head enlargements along the surface of the dendrites as gemmules. The axis cylinder process is termed the neuraxon; its branches, collaterals; and the terminations of these branches, end brushes. Immediately following the preface is a valuable description of the silver method of impregnation by Dr. Strong, recounting the manner of preparing the sections here employed for the plates, and explaining the modifications in technique which he has introduced with such good results. Upon the photographic methods employed, Dr. Leaming adds a chapter which will materially assist those who propose to work along similar lines.

The body of the book follows and contains LIII. plates, which are reproductions of photomicrographs, and thirteen diagrams, together with the corresponding text. The sections have

been made largely from human material. The nerve cells of the cord and spinal ganglia, and those of the cerebellum, quadigemina, thalami, striata and cerebral cortex, are represented and described in the order named. At the very end there is given a plate from Hammarberg illustrating the size and distributions of the nerve cells in six localities of the human cortex.

In the description of the plates cell structure is disregarded, because all structure is obliterated by the silver method, and attention is therefore given alone to the shape and size of the cell bodies and to the number, direction, form and terminations of their branches. The description of the plates forms but a fraction of the text, the remainder of which is a running account, by Dr. Starr, of the architecture of the parts named.

This lucid and terse account is purposely dogmatic and is well illustrated by the diagrams, many of which are essentially new.

Moreover, the teachings of the plates are used where the silver method has enlarged our notions of the architecture, and thus the plates are made contributory to the more general narrative. The double character of the connections between the different cell groups in the central system is one of the more important points which is emphasized throughout.

Turning to the plates themselves, which in the stricter sense compose the *Atlas*, the question is as to what is gained by the photographic representation of the sections. Our impression of a microscopic section is usually based on several pictures offered to the eye at different depths within the object, for such sections always have an appreciable thickness, and only one level can be brought in focus at a time.

Photo-micrographs necessarily give a picture of but one of these levels, and the rest of the specimen is out of focus. The picture thereby obtained is independent of the draughtsman's bias and rigidly accurate, exactly what is desired. Thus, in this case the plates show to perfection the cell bodies and the larger branches, which were accurately focused. On the other hand, the connection of the neuraxon with the cell body is often lost, for it not uncommonly passes out of focus just at the point of junction. So, too, the mass of dendrites, especially where most abundant, as in Purkinje's cells, is of necessity inadequately shown, and the proper relation of the end brushes to the dendrites is obscured.

If the draughtsman is in danger of too great completeness in his drawing the photo-micrograph suffers from a lack of this quality and shows far less than the specimens themselves. By this method therefore accuracy is gained at the price of limitation.

This criticism is intended for the benefit of those who at first sight may feel a disappointment that the whole matter is not entirely cleared up by photographic treatment. A reading glass can be used with advantage in the study of these plates, and, above all, they require careful scrutiny to be appreciated. The silver method is notoriously fickle, and it needs more than the usual skill and perseverance to obtain results by means of it; hence an atlas with good plates cannot fail to be useful to many persons and in many ways; and accompanied, as this one is, by a most instructive text, there can be no question of our indebtedness to the authors for their contribution to neurology.

H. H. DONALDSON.
UNIVERSITY OF CHICAGO.

*Die Insel Tenerife.* Von DR. HANS MEYER. Leipzig, S. Hirzel. 1896. 8vo, pp. VI., 328. Four maps and 33 illustrations.

The book before us makes good its claim as a scientific guide book to a most interesting region. Humboldt and many other well-known men have given us their estimate of these famous islands. The peak of Tenerife, from its beautiful form and location, has been a favorite theme even from the most ancient times, when the virtues and charms of the 'Fortunate Islands' were proclaimed by bards and philosophers.

The work, however, like many such attempts, while it is not technical enough for the scientist, has a decided advantage over a mere traveller's day book in that a great deal of scientific information of an accurate character and in an easily comprehended form is given in a pleasant and popular style. The origin of the early inhabitants as well as the fauna and flora are carefully treated, and while some vexed ques-

tions in ethnology are touched upon, there is nothing in the shape of a bitter attack upon former theories. The facts are brought out more as suggestions, and they are numerous and fruitful to the careful student, while they are of interest to the more superficial traveller, from the insight they give as to the influences, climatic and otherwise, which have supplied this bit of 'environment' with its germs, and have produced the peculiar life forms of the group.

The position of the islands in the belt of the Northeast Trade winds, which have been a predominant factor in causing the changes which have been brought about, indicate the immediate source of the forms of life to be largely southern Europe; since 60 per cent. of its birds, insects and flowers come from the Mediterranean basin.

The earliest human migrations must have been by boat, but all trace of any skill in this direction had completely disappeared by the time of the Spanish invasion, as no boats were found. The inhospitable shores and the dangerous surf must have been the cause of this condition of things. The land offered the settlers all they wanted and they were content. The theory suggested of the descent of the race, for it was a distinct type as described by the Conquistadors, from the Berber family, is very interesting reading.

From the time at which these islands were called the 'Insulæ fortunatæ,' by the expedition of the King of Mauritania in B. C. 40, they were practically lost sight of until 1402. In that year their relations with Europe began. It took nearly 100 years, however, to conquer the stubborn resistance of the real owners of the islands, and the fearful destruction of life is one of the saddest chapters in the history of Spanish colonization. To-day there is probably no pure blooded member in existence of the original race which inhabited the islands.

The island is still, however, the 'Ultima thule;' the troubles of civilized life do not bother the 'Isleño;' and the mild, balmy air makes it the wonderland of peace. If the almost wild activity of modern existence can be called life, then the Canaries supply us with the dreamland of childhood.

The author is evidently very much in love with the subject of his sketch, and the smooth surface of his description is only ruffled when he comes under the influence of the hated Spanish control, or the very loud English tourist. He is evidently a Sybarite in the enjoyment of nature.

His description of the trips made to all parts of the volcano are full of interest; and while it is true that the sketch given by Humboldt upon the occasion of his visit 100 years ago still holds good, there is much that is introduced of a geological nature, which cannot but help add to the pleasure of a trip to this locality on the part of one not familiar with this subject. As was to be expected, the best part of the book is the sketch of his trip to the main peak, and the word picture of the sunrise as seen from the top is extremely well done.

It seems a pity that even one sentence should appear in such a book which grates upon the scientific mind; but on page 64 a rather remarkable explanation is given which should not have escaped the author's attention. It reads as follows: "The difference in temperature between the soil and the air, and the friction of the wind upon the crest of the range, condense the moisture of the cold Trade wind into small banks of cloud." This explanation would hardly pass muster with the meteorologist; since the cause of condensation is not the mere contact of the air with the soil, or the friction against it, but the fact that the air current is forced into a higher and colder layer of air, which so reduces its relative humidity that the point of saturation is reached.

The maps of the book are carefully prepared, and they cover the field of geology, the forms of vegetation and the cultural regions, besides giving a good road map. The illustrations, while they are good, are not what might be expected from clear photographs when reproduced by some of the more modern processes.

At the close of the work is a discussion of the craniological collection by Dr. F. von Luschan, which is to be regarded as a preliminary notice, since the main results are reserved for a future publication.

William Libbey.

Princeton University.

[redacted]

George Brown Goode, one of the ablest and best men in America, died at Washington on September the sixth, at the age of forty-five years.

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